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# AN ENVIRONMENTAL AUDIT MANAGEMENT PLAN FOR THE ROYAL AUSTRALIAN AIR FORCE

THESIS

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# AN ENVIRONMENTAL AUDIT MANAGEMENT PLAN FOR THE ROYAL AUSTRALIAN AIR FORCE

THESIS

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of the Air Force Institute of Technology
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Warren L. Lear

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## Abstract

The purpose of this research was to develop an Environmental Audit Management Plan (EAMP) tailored to meet the specific requirements of the Royal Australian Air Force (RAAF). The research also examined the resources which would be required to introduce the proposed EAMP into the RAAF.

Environmental compliance auditing can be described as a management tool which an organisation uses to carry out a structured and systematic evaluation of its environmental performance. The adoption of a compliance auditing program would provide the RAAF with a systematic and effective organisation-wide management tool for improving environmental performance at all RAAF facilities.

The literature on environmental compliance auditing identifies a number of essential characteristics required for an effective environmental auditing program. These characteristics, in conjunction with the USEPA design guidelines for the development of audit programs for government agencies, were used to guide the development of the RAAF EAMP. Information on Australian environmental legislation, DOD/RAAF policies and regulations, and details of the RAAF Base Tindal Environmental Management Plan were placed within this framework to produce the EAMP. The USAF

Environmental Compliance Assessment and Management Program was also used as a practical example of an existing audit management plan to provide further guidance in the preparation of the RAAF EAMP.

Based upon an analysis of the above information, recommendations were made concerning the specific items considered appropriate for inclusion in the RAAF EAMP. The proposed RAAF EAMP was based on these recommendations.

To determine what would be required to implement the proposed EAMP, data on the implementation and operation of ECAMP was collected and analysed. Based on this information, estimates of the resource requirements associated with implementation of the EAMP were prepared.

# AN ENVIRONMENTAL AUDIT MANAGEMENT PLAN FOR THE ROYAL AUSTRALIAN AIR FORCE

## I. Introduction

### General Issue

In recent years in Australia, public awareness of environmental issues and concern for environmental problems have grown rapidly. During this period, a considerable proportion of the Australian community has become aware of a broad range of environmental and conservation issues (17:109), and social values regarding these issues have been changing (16:269). Environmental issues now have much greater credibility, and receive a good hearing from both the media and politicians (18:12). As a consequence, environmental issues have been elevated in importance in the minds of many people, and have also developed into high-profile political issues and priorities. According to Davis, "environmentalism must now be regarded as a major force within the Australian community" (16:275).

This higher priority has led to the enactment of many new legislative requirements and regulations at all levels of government, including the Commonwealth, State and Territory, and local government levels (16:270). As is the case for many organisations, a large number of these environmental laws and regulations impact directly upon the

facilities and operations of the Royal Australian Air Force (RAAF).

As a constituent element of the Commonwealth Government Department of Defence, the RAAF is required to comply with all Commonwealth Government legislation and regulations. While not legally bound to comply with state, territory, or local government laws and regulations, the RAAF very actively pursues compliance with all such laws and regulations as part of the Commonwealth Government's 'good neighbour' policy, which is practiced at all RAAF installations and facilities. The requirement for compliance with all applicable environmental laws and regulations, including legislation enacted at all levels of government, is an extremely complex issue given the volume and diversity of the laws and regulations involved. In addition to the requirement to be aware of all applicable laws and regulations at each individual site, a geographically-dispersed organisation like the RAAF also needs to be aware of the differences in requirements from site to site, further adding to the complexities. Despite this requirement for compliance at all facilities and locations, the RAAF to date has not applied any systematic RAAF-wide management to the issue of environmental compliance.

A number of organisations in the United States, including the United States Air Force (USAF), which have

been confronted with this same problem, have been able to identify and correct large numbers of compliance violations through the implementation of organisation-wide environmental compliance audit management plans. These audit management plans are aimed at achieving and maintaining compliance with all applicable environmental laws and regulations at all sites. Reed reports that the use of environmental compliance auditing by companies in the United States private sector "has grown steadily" (30:113), and because of its ability to improve "overall environmental performance, the practice has captured the attention" of many organisations in the United States (30:113).

Many of the environmental compliance auditing programs, including the USAF Environmental Compliance Assessment and Management Program (ECAMP), have achieved considerable success in identifying and rectifying noncompliance problems. In the case of the USAF ECAMP, the number of noncompliances identified through the ECAMP process during 1990 and 1991 was of the order of 3,000 per year (3). Of these noncompliances, approximately 80 percent were assessed as being quick and easy to rectify, and all noncompliances have either been rectified or programmed for rectification. The development and implementation of an environmental compliance audit management plan specifically designed to meet the needs of the RAAF should similarly help to significantly improve the RAAF's compliance performance.

Such a plan would provide a systematic and effective RAAF-wide management tool for improving environmental compliance at all RAAF facilities.

## Statement of Problem

The purpose of this thesis is to develop an Environmental Audit Management Plan (EAMP) which meets the specific requirements of the RAAF, and to then assess the requirements for implementing the proposed EAMP.

## Research Objectives

In order to achieve the purpose of the thesis, the following objectives were used to guide the research:

1. Development of an EAMP to meet the specific requirements of the RAAF. This included an investigation of the following questions:
    a. What should be the objectives of an EAMP for the RAAF?
    b. What does current literature recommend for the development of a successful environmental compliance audit management plan?
    c. What relevant Australian environmental legislation exists?
    d. What work has the RAAF done to date in the area of environmental compliance?

e. Which elements of the USAF ECAMP program are applicable to the requirements of the RAAF, taking into account those factors which are unique to Australia and the RAAF?

2. Determine what would be required to implement the proposed RAAF EAMP. This included an investigation of the following questions:

a. What functional areas should be responsible at the Headquarters, Command and Base levels?

b. What regulations would be required?

c. What procedures and guidelines would need to be developed?

d. What education and training of personnel would be required?

e. What are the manpower implications?

f. What are the financial implications?

g. What funding is available for implementation, training, conduct of audits, and remediation?

h. What would be one potential reallocation of resources to allow for implementation of the proposed EAMP?

Scope and Limitations

The RAAF's specific requirements, which include those requirements which are unique to Aus+ alia and the RAAF, have been determined from an examination of Australian

environmental legislation; Department of Defence (DOD) and RAAF environmental policies; and RAAF operations, facilities, processes and resources. Literature on environmental compliance auditing has been reviewed to determine those elements which past experience has identified as being essential for the development of an effective auditing management plan. This information has then been used to provide the basis and structure of the RAAF management plan. The USAF ECAMP was specifically designed to meet the requirements of a modern Air Force and has been successful in improving the USAF's compliance performance through the identification and rectification of large numbers of existing noncompliances. This program was therefore considered to be the most appropriate example of an existing environmental compliance auditing management plan to be used as a practical example to further guide the development of the RAAF EAMP. Examination of the implementation of the proposed EAMP focused specifically on what resources would be required, and how these resources might be provided.

While general literature on the subject of environmental compliance auditing has been reviewed in considerable detail to provide a basis for the EAMP, specific environmental compliance audit management plans developed by organisations other than the USAF have only been examined generally rather than in detail. The USAF

ECAMP is therefore being assumed to be the most appropriate existing program which can be used as a guide for the development of the RAAF EAMP.

While development of the EAMP to meet the requirements of the RAAF has been based upon firmly identified factors, such as RAAF operating procedures and facilities and Australian legislative requirements, the management plan represents only one possible solution. The Australian requirements could undoubtedly be combined with the identified elements of effective environmental compliance auditing in a number of ways, each producing different yet equally effective forms of the management plan. The intent of this research therefore was not to develop the one and only environmental compliance audit management plan which would be applicable to the RAAF, but rather to develop one version of such a plan which can be demonstrated to meet the needs of the RAAF.

Following development of the proposed plan, implementation of the plan by the RAAF was examined. Given current tight fiscal constraints and planned reductions in total personnel numbers within the Australian Defence Force (ADF) and the RAAF, it was recognised that any additional resources required to implement the management plan would have to be provided from existing sources, with appropriate offsets identified as necessary.

## Definition of Environmental Compliance Auditing

The U.S. Environmental Protection Agency (EPA) defines environmental compliance auditing as "a systematic, documented, periodic, and objective review by regulated entities of facility operations and practices related to meeting environmental requirements" (36:46504).

Bertino, in an article on performing compliance audits, expands this definition by describing an environmental audit as

> a systematic review of physical facilities, documents, operations, and personal interviews that helps disclose the compliance (regulatory or policy), risk status (danger of episodes to the community, the environment or the employees), and management practice status of the facility being audited. *Systematic* implies that the program will carefully define what the auditor will be looking for before beginning the audit. (8:46)

Bertino further states that "compliance audits are used to gauge how environmental management programs are doing: Is the facility in compliance with all applicable regulatory requirements" (8:46)?

## Background

The United States Air Force (USAF) has developed the Environmental Compliance Assessment and Management Program (ECAMP) as a means of ensuring compliance with all applicable federal, state, local, Department of Defense, and USAF environmental regulations at USAF facilities and installations. The policy details of ECAMP are contained

within Air Force Regulation 19-16. The introduction to this regulation describes ECAMP as

> a comprehensive self-evaluation and program management system for achieving, maintaining, and monitoring compliance with environmental laws and regulations through the use of environmental compliance evaluations and management action plans at Air Force installations. (19:1)

The establishment and implementation of the Air Force-wide ECAMP resulted from the identification, in the mid 1980s, of serious deficiencies in the Air Force's compliance with environmental requirements, along with concern over the growing number of Notices of Violation (NOVs) being received from regulatory agencies (34:1).

In a letter dated 14 June 1988, the Office of the Chief of Staff noted that most of the environmental compliance problems stemmed "from a general lack of awareness of the many and varied requirements" (34:1). ECAMP attempts to address such compliance problems "based on the premise that compliance can be achieved by changing procedures, increasing education and training, and devoting the resources to work the tough issues" (34:1). ECAMP was designed to educate and train personnel to identify, assess and manage environmental compliance problems, and to allow appropriate changes to operating procedures or remedial actions to be implemented or programmed, as required.

The USAF leadership is fully committed to the implementation of ECAMP and to full environmental compliance at all USAF installations. In a policy letter entitled

"Environmental Leadership," dated 17 April 1991, General McPeak, the USAF Chief of Staff, outlined five specific environmental goals for the Air Force (29:1). The second of these goals is to "Ensure our present operations comply with all federal, state and local environmental standards. No notices of violation is the measure of merit" (29:1). He went on to state that

> proper attention to the environment today will ensure that we can perform our mission in the future. I expect the Air Force to lead the DOD in environmental protection and compliance. (29:1)

Given the growing importance and emphasis now being placed upon environmental matters in Australia, proper attention to the environment by the RAAF is increasingly seen as also being an essential requirement for the RAAF. By meeting its environmental obligations, the RAAF will be better positioned to achieve its mission of conducting effective strategic and tactical air operations in the pursuit of Australia's defence and national interests.

## General Approach

In Chapter II of this report, available literature on the topic of environmental compliance auditing has been reviewed. In particular, literature which identifies the elements of effective environmental compliance auditing has been highlighted. A general overview of literature on the current status of environmental issues in Australia has also been included in this chapter.

Chapter III examines the methodology used for identifying the RAAF and Australian requirements which formed the basis of the RAAF EAMP. The methodology for combining these requirements with the required elements of effective environmental compliance auditing is then discussed. Chapter III concludes with a discussion of the methodology for identifying and quantifying the requirements for implementing the RAAF EAMP.

The findings of the research and the analysis of those findings are included in Chapter IV. This chapter includes details of each of the Australian requirements and the incorporation of these requirements into the proposed RAAF EAMP, using the identified elements of effective environmental compliance auditing as a basis. The result was the preparation of a proposed RAAF EAMP which is included as an appendix to this report. An examination of the resources and other requirements needed to implement and operate the proposed plan are also included, using the requirements for ECAMP as a basis. An attempt has also been made to identify where these resources might be found within the existing RAAF organisation.

Finally, conclusions and recommendations have been presented in Chapter V.

# II. Literature Review

## Chapter Overview

The purpose of this literature review is to describe and summarise the available information on the relatively new topic of environmental compliance auditing. An environmental compliance audit is an audit which is performed to assess whether a particular organisation or facility is in compliance with all of the applicable environmental laws and regulations.

The review provides an insight into the topic of environmental compliance auditing, and then builds on this with sufficient background material to develop a sound understanding of the topic. The review then provides a comprehensive summary of the information which is available on environmental compliance auditing, which serves as a foundation for this study.

## Scope of the Review

Initially the review seeks to briefly describe the current status of environmental issues in Australia. This includes a discussion of the growing importance of environmental issues to Australians, and therefore ultimately to the RAAF, and provides the context for the development of the EAMP. Available literature has then been reviewed to describe what environmental compliance auditing

means and to identify the benefits which compliance auditing offers. The general application of environmental compliance auditing in the United States is then examined, including a look at its application to federal facilities, the Department of Defense, and the U.S. Air Force. Finally, a review of the literature on the implementation and conduct of environmental compliance auditing has been carried out to draw on the experience of those individuals and organisations who have been involved with environmental compliance auditing. The aim of this review has been to identify those elements and procedures which should be included in an effective audit management plan. This information has subsequently been used in Chapter IV to form the basis of the RAAF EAMP.

The specific subject areas touched upon in this review include a description of the status of environmental issues in Australia; a description of environmental compliance auditing; the benefits of auditing; auditing in the United States, including auditing by federal agencies, the Department of Defense, and the Air Force; and identification of those elements which are essential for a sound environmental compliance audit management plan.

## The Status of Environmental Issues in Australia

Widespread awareness of environmental issues in Australia began to develop in the late 1960s, largely in

response to conservation concerns. The first of these issues to gain national prominence was a proposal by the Tasmanian State Government to inundate a large tract of the Lake Pedder wilderness area through the construction of a dam associated with a hydroelectric power generation project. This issue remained controversial during the period 1967-1976, and is considered by many to be the beginning of the conservation and environmental movements within Australia (17:108). As a direct consequence of this controversy, the United Tasmania Group political party was formed in 1972. According to Davis, this group was "the world's first environmental political party" (17:108). Since that time, there have been a number of major conservation and environmental controversies in Australia, which in the words of Davis, "have aroused much public comment, [and] occupied considerable time and effort within government" (16:269).

There are now estimated to be several hundred various local, regional, and national environmental organisations within Australia, the principal of these being the national Australian Conservation Foundation. By the early 1980s, these organisations began to be much better organised and sophisticated, and as stated by Davis, they "constituted a loose coalition with considerable political clout, expertise on technical issues, and competence" (17:109). Also, by this time, a considerable proportion of the Australian

community was becoming aware of a broad range of environmental and conservation issues (17:109), and social values regarding these issues began to change (16:269).

Starting with the federal election in 1983, and at all subsequent federal elections and also at a number of state elections, environmental groups have been able to exert considerable political influence as a consequence of their ability to campaign effectively for key marginal seats (17:109). This has resulted, to some extent, in the major political parties competing with each other to gain the environmental vote. Consequently, the environmental movement has been able to greatly elevate the importance of the environment as a political priority, and has been able to secure significant promises and legislation from a number of governments, including the Commonwealth Government (17:109).

Estimates of the number of members of environmental groups in Australia vary widely. Davis reports that estimates of membership range from 120,000 to 300,000 (17:108). Whilst these figures are very imprecise, even the lower limit represents a significant number out of a total population of 17 million people. In addition to their direct political activities, the environmental groups have also considerably increased public awareness and concern about a wide range of environmental issues. Consequently, support for environmental issues now has a much broader

base, and many Australians are now seeking greater input into environmental decision-making (14:115). Day reports that environmental issues have a good hearing by both politicians and the media, and that environmental issues have had "much more media voice and credibility in the past five years" (18:12). According to Davis, "environmentalism must now be regarded as a major force within the Australian community" (16:275).

In response to this growing public awareness, various governments, and the Commonwealth Government in particular, have adopted a number of position statements and enacted new legislation concerning the environment. Included among these has been the first comprehensive national environmental policy statement, Our Country, Our Future, issued in 1989, which has been described as a synthesis of the many diverse environmental programmes, and a holistic look at all of the environmental issues facing Australian society (18:10). This policy statement identified a number of mechanisms for change, which in addition to economic incentives, education, individual action and co-operation, also included laws and regulations. Australia's adherence to international environmental treaties and conventions has also been a driving factor in setting new Commonwealth environmental policy and legislation.

In addition to Commonwealth environmental legislation, Davis reports that

> all of the Australian States have introduced land-use management reforms, environmental impact assessment, enlarged national park systems, air and water quality controls and some coastal and marine conservation guidelines. (16:270)

Davis notes that there have been significant advances in recent years in environmental policy and management, but also comments that there are still many identified weaknesses which remain to be addressed (16:271).

Therefore, in addition to the considerable amount of environmental legislation enacted in recent years, a reasonable assumption would be that there will be no reduction in the foreseeable future in the amount of new legislation being introduced. The consequence of this for the RAAF, as for many other organisations, is that environmental compliance will continue to become more complex, challenging, and crucial.

## Description of Environmental Compliance Auditing

As discussed in Chapter I, the U.S. Environmental Protection Agency (EPA) defines environmental compliance auditing as "a systematic, documented, periodic, and objective review by regulated entities of facility operations and practices related to meeting environmental requirements" (36:46504). The International Chamber of Commerce definition of environmental auditing is:

> a management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing with the aim of helping to safeguard the

environment by:
(i) Facilitating management control of environmental practices;
(ii) Assessing compliance with company policies, which would include meeting regulatory requirements. (38:1)

Although the term 'environmental auditing' is the one most commonly used for this activity, other terms used by some organisations to describe this function include environmental surveillance, environmental review, environmental quality control, and environmental assessment (38:1). The simplest definition of environmental compliance auditing is that it is a management tool used by an organisation to assess its environmental performance.

According to Reed, environmental auditing is "a structured and systematic approach to self-evaluation of environmental performance" (30:113). Similarly, Thurman describes environmental auditing as "the verification and evaluation of the compliance status of facilities and activities with State, Federal, and local regulations and ... environmental policies and procedures" (37:707). Reed also makes the point that

> an environmental auditing program should be distinguished from firefighting audits such as waste characterization studies, noise audits, or trace element surveys, which are often more narrowly focused and are conducted on a one-time basis in response to a specific problem. (30:113)

Experience has shown that no one system of environmental compliance auditing is right for all organisations. Each organisation needs to define its own

requirements and methodologies based upon such factors as size, function, activities, and "its own culture" (38:5).

## Benefits of Environmental Compliance Auditing

There are many potential benefits for organisations which conduct their own environmental compliance audits, using either internal resources, external specialists, or a combination of both.

Attitude of Regulatory Authorities. One of the potential benefits is the attitude which regulatory authorities are likely to adopt in the event of an unintentional regulatory violation. In order to encourage compliance auditing, it is the USEPA's policy to take into account any internal environmental compliance auditing efforts which an organisation has made when assessing enforcement actions in response to unintentional violations. Zirschky describes this approach with his comment that

> facilities that undertake a good-faith auditing and corrective action program to ensure compliance may reasonably expect some leniency with regard to regulatory penalties, should a regulatory violation occur. (40:44)

Farran et al also note that an organisation which has established an effective compliance auditing program is more likely to have a cooperative relationship with the regulatory authorities, "rather than an adversarial one" (23:10240).

Reduced Financial Liability. Another potential benefit of conducting environmental audits is to identify and reduce the level of financial liability which an organization may have in terms of environmental obligations. Sand describes how a number of multinational corporations now carry out their own regular environmental compliance audits, at each of their sites, to ensure that

> regulatory requirements and long-term environmental liabilities (such as waste disposal duties) are reflected accurately in the balance sheets of their subsidiaries. (33:43)

In the words of Royston et al,

> prevention is better than cure. And one of the best ways of preventing environmental problems is to ensure that all aspects of a company's operations and management are environmentally sound. (32:20)

Cheremisinoff et al also make the point that "an organization's failure to comply with environmental regulations can result in legal actions which can pose substantial financial risk" (12:72). Potential financial liabilities include "remedial action costs, personal injury claims, property damage claims and penalties imposed by legal, state, and federal government for non-compliance" (12:72). Hedstrom et al also make the comment that "the up-front costs of some auditing investigation and prevention can significantly outweigh the potential downstream costs associated with noncompliance" (25:12).

Identification of More Efficient Procedures. Environmental compliance audits also often identify new

processes, procedures, methods and materials which not only reduce environmental liabilities, but which can also result in more direct cost savings. Reed identifies this benefit with the comment that "without some sort of structured review program, inefficient and ineffective environmental practices can continue undetected, much to the detriment of the firm" (30:113). Reed also notes that "successful audit programs can lead to ... better communication and information sharing" (30:113) within an organisation, which by itself will often improve efficiency. This is supported by Thurman, who states that "a well-managed environmental auditing program provides a very valuable management and employee information system" (37:708). In addition, compliance auditing will also often lead to the identification and rectification of potential health and safety problems (10:16).

Of particular importance, Reed notes that

> environmental auditing will result in increased environmental protection to the extent that it results in an improvement in the efficiency and effectiveness of a company's existing environmental protection activities. This is done by increasing the number and type of environmental deficiencies identified ..., by increasing the certainty and speed by which corrective measures will be designed and implemented, and by providing mechanisms by which the effectiveness and appropriateness of implemented control measures can be evaluated. (30:115)

Avoidance of Civil/Criminal Penalties. Compliance audits also help to avoid situations which could potentially result in criminal penalties and civil fines, along with the

poor publicity associated with such actions. Indeed, significant public relations benefits and good will can result from an effective environmental compliance auditing program. Environmental auditing provides a mechanism for assuring the managers of an organisation that "environmental activities throughout the corporation are being managed in an effective, responsible and legal manner" (30:114).

Early Identification of Problems. Regular compliance audits generally result in the early identification of compliance problems, thus allowing an organisation more time to adequately plan a compliance strategy. Similarly, a less costly solution to a problem may be found, rather than a solution imposed by a regulatory authority. This is described by Austin, who comments that

> from a company's point of view, an environmental audit can lead to the least costly means to clean up of a problem, as opposed to having a government prescribe a solution without concern for costs. (6:93)

Austin also advocates that "an innovative, thoughtful environmental audit" is one of the most effective methods to guard against future environmental liabilities (6:93). This is supported by Bleiweiss et al, who define the purpose of an environmental audit program as being to "identify and correct, as early as possible, any existing or potential environmental compliance problems or environmental liability risks present in an operation" (10:15).

Environmental Awareness. Another advantage of environmental audits is that organisations which have

seriously examined their environmental practices are more likely to take voluntary, responsible precautions with regard to the environment (6:93). The advantage of this to an organisation is that increased environmental knowledge and awareness amongst the staff should lead to reduced environmental liability. According to Farran et al, employees of an organisation would also be more likely "to pursue investigation of potential violations if their company had an established self-audit and corrective action program" (23:10240). In the words of Bleiweiss, "environmental audit programs are effective tools to sensitize ... personnel to environmental issues and related corporate concerns" (10:16).

Increased environmental awareness should result in better environmental management, which is increasingly being seen as an essential component of good overall management. Elkington makes the point that "environmental auditing is now part of a quality approach to environmental management - indeed, it can be seen as part of the overall drive for quality assurance" (20:17).

Public Relations. In the words of Reed, "few issues hold greater consequences for corporate credibility than those related to the environment" (30:113). By conducting an effective compliance auditing program, an organisation can demonstrate that it is genuinely concerned about environmental issues. In addition, the conduct of such a

program should lead to improved environmental performance, thereby helping to avoid the adverse publicity which can result from noncompliance. Thurman identifies improved public image along with a good reputation with the regulators as two of the direct benefits of environmental compliance auditing (37:708).

Systematic Approach to Compliance. A compliance auditing program provides a regular and systematic method for monitoring environmental compliance and performance. Consequently, an effective compliance auditing program can help to assure organisational managers at all levels that environmental activities "are being managed in an effective, responsible and legal manner" (30:114) and that the organisation's operations "are in compliance and that effective means are in place for managing environmental risks" (25:11). The information provided from this systematic and regular monitoring of performance also gives a sound data base which can be used by management for "decision-making, negotiations with regulators, and public relations" (30:114). Reed identifies a number of other benefits associated with a systematic approach to compliance auditing, including:

> assist[ing] facility management through increased training and education of employees regarding such things as environmental regulations, long-term trends, corporate philosophy, management and control practices, and operating procedures. (30:114)

Farran et al also identify benefits of compliance auditing which go beyond verification and monitoring of compliance with environmental regulations. They state that compliance auditing is a valuable management tool which can also be used for "cost control, risk management, and growth planning, and it also enables management to respond appropriately when new laws are adopted" (23:10239).

There are a number of benefits for organisations which conduct effective environmental compliance auditing programs. These potentially include improved relationships with regulatory authorities, reduced financial liabilities, identification and introduction of more efficient operating procedures, avoidance of civil and criminal penalties, early identification of problems, and increased environmental awareness.

## Environmental Compliance Auditing in the United States

The origins of environmental compliance auditing can be traced back to the early 1970s,

> when a handful of companies, working independently and on their own initiatives, developed audit programmes as internal tools to review and evaluate environmental problems at the operating unit level. (25:11)

Environmental compliance auditing in the United States received greater emphasis in 1986 when the USEPA published a policy statement "addressing auditing issues and setting

forth the basic elements of effective environmental auditing" (23:10240).

Requirement for Environmental Compliance Auditing. There is no legal requirement for regulated entities to establish and conduct their own environmental auditing programs. However, such action is actively encouraged by the USEPA, as indicated in the EPA Environmental Auditing Policy Statement of 1986. This states, in part, that

> it is EPA policy to encourage the use of environmental auditing by regulated entities to help achieve and maintain compliance with environmental laws and regulations, as well as to help identify and correct unregulated environmental hazards. (22:25004-25010)

This policy is summarized by Zirschky, who states that "environmental compliance auditing is encouraged by the U.S. Environmental Protection Agency (EPA) as a means to help ensure compliance with environmental regulations" (40:44). Farran et al comment that in the policy statement, "EPA recognized the effectiveness of audits and expressly encouraged regulated entities to adopt sound environmental management practices, including auditing programs" (23:10240).

Environmental Compliance Auditing by Federal Agencies. The EPA Environmental Auditing Policy Statement of 1986 states, under the heading of "Environmental Auditing at Federal Facilities," that

> EPA encourages all federal agencies subject to environmental laws and regulations to institute environmental auditing systems to help ensure the

> adequacy of internal systems to achieve, maintain and monitor compliance. (22:25004)

Bertino has interpreted this policy statement as encouraging federal facilities

> to adopt sound environmental management practice, specifically environmental auditing, to help achieve and maintain compliance with applicable environmental requirements as well as to help identify and correct unregulated environmental hazards. (8:45)

Ensuring compliance by federal facilities is a very challenging task due to the sheer number and size of federal facilities, the wide range of activities conducted and materials used, and in the words of Davidson and Grundler, "the potential for overlap of jurisdictional and/or statutory authority" (15:55).

However, these authors also point to the benefits to be gained by the federal government from using federal facility compliance programs to take the lead in addressing environmental protection and management challenges. They advocate that

> by applying the significant resources and expertise of the federal government on these and related challenges, the United States can exhibit true leadership in the environmental management arena. (15:66)

Environmental Compliance Auditing in the Department of Defense. The Department of Defense (DOD) fully endorses the concept of compliance with all environmental laws at each of its establishments. The requirement for the various constituent elements of the Department of Defense to perform environmental compliance audits was first introduced in 1985

when the Deputy Assistant Secretary of Defense, Installations, issued policy to "perform self-evaluations for compliance in all echelons of environmental requirements" (35:1).

Bertino attributes this requirement for the constituent elements of the Department of Defense to perform environmental compliance auditing to the

> increasing regulatory requirements, enforcement activities, policy statements, executive orders, criminal liabilities of federal facilities employees, and the recent public discovery of high levels of non-compliance. (8:45)

Hourcle, in reporting upon the current strategic plan for DOD's environmental leadership program as developed by the Deputy Assistant Secretary for Environment, notes that the overall leadership program has six goals (27:114). The first of these goals is compliance with environmental laws.

Environmental Compliance Auditing in the USAF. As described in Chapter I, the USAF has developed ECAMP as a program of environmental compliance auditing and management to ensure compliance with all applicable federal, state, local, Department of Defense, and USAF environmental regulations at USAF facilities and installations.

The objectives of ECAMP, as contained within Air Force Regulation 19-16, are as follows:

a. Improve Air Force environmental management worldwide.
b. Improve Air Force environmental compliance and compliance management in the United States and Possessions.

c. Build supporting financial programs and budgets for environmental compliance requirements.
d. Ensure that MAJCOMs, installation commanders, environmental protection committees, environmental coordinators, bioenvironmental engineers, and natural resource managers environmental programs are effectively addressing environmental problems that could:
   (1) Impact mission effectiveness.
   (2) Jeopardize the health or safety of Air Force personnel or the general public.
   (3) Significantly degrade the environment.
   (4) Expose the Air Force and its people to avoidable financial liabilities as a result of noncompliance with environmental requirements.
   (5) Erode public confidence in the Air Force and the defense establishment.
   (6) Expose individuals to civil and criminal liability.
e. Anticipate and prevent future environmental problems. (19:3)

Major General Ahearn, former Air Force Director of Engineering and Services, stated that ECAMP assists local installation commanders in five ways. Implementation of ECAMP:

a. Enhances Air Force compliance with federal, state, and local regulations.
b. Assures commanders that their environmental programs are effective.
c. Improves Air Force compliance management.
d. Provides data for identifying, programming and budgeting;
e. Provides timely, accurate, and complete information. (1:8-9)

ECAMP is fully supported by the USAF leadership as an essential program required for the achievement of the Air Force mission.

In an article by Collard, the successful implementation of the ECAMP at Tinker AFB is described. Through the training and participation which the ECAMP provides for base

personnel, organisations at Tinker are assessed as being better able to identify and correct environmental compliance problems at the base. ECAMP is also described as giving the commander "a scorecard on how well the base is complying with Air Force, federal, and state environmental regulations" (13:79). Early internal identification of environmental compliance problems at Tinker has also led to large numbers of these deficiencies being quickly rectified.

Whilst there is no legal requirement for regulated entities in the United States to conduct their own environmental compliance auditing programs, such programs are actively encouraged by the EPA. In the case of federal facilities, the EPA specifically encourages agencies to implement environmental auditing systems. The Department of Defense introduced the requirement for environmental compliance auditing by the Services in 1985, and the USAF has introduced ECAMP as a program of environmental compliance auditing and management for the Air Force.

## Effective Environmental Compliance Auditing

The literature on environmental compliance auditing prepared by individuals and organisations with experience in conducting environmental audits contains much valuable information on how to make the auditing process more effective. However, throughout this literature, there are a number of essential elements for effective compliance

auditing which are repeatedly identified. These essential elements are discussed below in some detail.

Top Management Support. The explicit support and backing of the upper management of an organisation is essential for the success of any environmental compliance auditing program within an organisation. This requirement for top management support is identified as being essential by a number of authors, including Bleiweiss (10:16), Hedstrom et al (25:12), Thurman (37:709) and Elkington (20:19).

Commitment to Follow-up on Findings. Just as upper management support for an auditing program is essential, so too is the commitment of the upper management to following through on the findings of the audits. Reed describes follow-up and feedback procedures as "corner-stone features of effective environmental auditing" (30:114). Reed also recommends that follow-up and feedback procedures "should be formalized and the role and accountability of appropriate constituencies clearly established" (30:115). A commitment to follow-up on findings is identified as an essential element of an effective auditing program by a number of authors, including Bleiweiss (10:16), Reed (30:114), Thurman (37:710) and Elkington (20:19).

Independent Auditors. For an auditing program to be successful, there is a need for the auditors to be independent of the audited activities and facilities. This

not only increases the effectiveness and objectivity of the auditing program, but also its credibility. Not only should auditors be independent, but they should also be seen as independent. The use of independent auditors also offers the advantage of bringing in qualified people who can view procedures and facilities with 'a new set of eyes', often resulting in new ideas and benefits. In instances where it is not feasible or practical to bring in independent auditors, it is essential that this limitation be clearly identified in the written audit report. The requirement for independent auditors is identified as an essential element of an effective auditing program by a number of authors, including Bleiweiss (10:16), Hedstrom et al (25:12), Thurman (37:709) and Reed (30:113).

Staffing and Training. An effective auditing program requires adequate staffing and proper training of the auditors. Members of the auditing team are required to carry out both environmental compliance assessment and verification. Reed describes 'environmental assessment' as referring to

> the professional judgement or opinion of the audit team members regarding the adequacy and effectiveness of environmental controls as well as the existence and magnitude of environmental hazards. (30:114)

Reed defines 'environmental verification' as

> the empirical testing of the facility's performance, in order to determine compliance with environmental regulations, the accuracy of environmental data and reports, and the application of and adherence to

> corporate policies, procedures and good management practices. (30:114)

Given that assessment as well as verification is required as part of any audit, adequately trained and qualified audit team members are essential. While some organisations use outside consultants for auditing, many train and develop their own personnel to keep the audit function in-house and to expand the environmental knowledge and expertise of the organisation. Increasing the environmental awareness and knowledge of the personnel within the organisation is very beneficial as, according to Bishop et al, increased knowledge affects attitudes, which in turn affect behaviour (9:278). Consequently, increased environmental knowledge should lead to more concerned environmental behaviour. In addition to being professionally qualified, auditors also need to be totally objective.

According to Hedstrom et al, "the effectiveness of the audit programme is a direct result of the confidence, training, expertise, and proficiency of the personnel who conduct the audits" (25:12). These authors also make the point that the training and proficiency in auditing of the team members needs to be commensurate with the scope and complexity of the audit to be conducted. Hedstrom et al further state that

> it is important that the audit team understand regulatory requirements, relevant environmental control technologies, and facility operations and processes, and that the auditors have the appropriate audit training and competence [including good communications

> skills] required to perform the type of audit investigation that is called for by programme objectives. Specialized training in auditing methods and techniques ... can be crucial. (25:12)

Other authors who have identified proper training of the auditors as an essential element of an effective auditing program include Bleiweiss (10:16), Cheremisinoff et al (12:72), Reed (30:115), Thurman (37:709) and Elkington (20:19).

Program Objectives. Program objectives need to be clearly and explicitly stated, and should include details of the scope of the program and the frequency of audits. These objectives must be supported by, and consistent with, managers' views and needs, and must be realistic in terms of the resources required to meet the objectives. The provision of adequate resources to achieve the program objectives is also necessary. As stated by Gilbert et al, "every audit objective requires the commitment and expenditure of resources to be competently and consistently achieved" (25:11).

Audits generally are conducted on a regular cycle, which in many cases is annually. In the case of organisations which have more sites than can reasonably be audited on an annual basis, decisions need to be made as to which sites to audit. Gilbert et al recommend the implementation of

> a formal audit selection/scheduling process which reflects the inherent environmental risks and exposures

> and provides for a mechanism realistically to assess performance across the corporation. (25:11)

They further recommend that this process should emphasise auditing of major facilities, but should also include some smaller facilities (25:11).

Generally auditing programs are applied on an organisation-wide basis. In addition to explicitly stating the program objectives, it is also very important to communicate those objectives throughout the entire organisation. Thurman recommends that an organisation should have "a written charter or organizational statement which details in writing the program purpose, objectives, responsibility, and scope" (37:710). In addition to clearly identifying the scope of the overall auditing program, it is also important to clearly define the scope of each individual audit exercise, again taking into account both the program objectives and resource constraints. The requirement for clear and specific program objectives is identified as an essential element of an effective auditing program by a number of authors, including Bleiweiss (10:16), Reed (30:113) and Gilbert et al (25:11).

Clearly Defined Procedures. Defined procedures for effectively conducting the audits are highly recommended. These should include procedures for conducting the physical inspections, conducting interviews, collecting information, and analysing and interpreting the information to achieve the objectives of the auditing program. Often checklists

and questionnaires are used in addition to physical observation and interviews. All procedures should be systematic and clearly defined. Where possible, audits should attempt to quantify any measurable aspects. Generally audits are conducted by a team of qualified personnel who conduct on-site investigations. In addition to inspecting operations, procedures and facilities, the team also needs to examine records, documentation, training programs, and inventories. Internal controls and existing management systems should also be reviewed to check their appropriateness for achieving the necessary level of environmental compliance.

Many organisations have developed explicit instructions which describe how an audit should be conducted. One useful instrument which provides guidance to the audit team for conducting an inspection and collecting information is the audit protocol. Hedstrom et al describe an audit protocol as typically being

> a written plan that contains a list of specific audit procedures to be used to gather evidence in the field. Many audit protocols not only outline the topics to be reviewed, but also specify the nature of the audit examination and the depth of the audit review. Such protocols provide for greater consistency among audits and for the establishment of a baseline auditing effort. They provide direction or guidance about what types of, and to what degree, audit inquiries, observations, and verifications should be undertaken. Identification of which items are to be evaluated and to what degree can be important in increasing the effectiveness of an environmental audit programme. (25:12)

Clearly defined audit procedures are identified as an essential element of an effective auditing program by a number of authors, including Bleiweiss (10:16), Reed (30:115), Royston et al (32:20), Thurman (37:711) and Elkington (20:19).

Audit Reports. Written reports detailing the findings of the audit are also highly recommended. These should be clear, accurate, informative and honest. The written reports should also be prepared promptly. Findings should be communicated throughout the organisation to identify or prevent similar problems at other facilities or locations. Included in the report should be sufficient documentation to support the audit results and to also demonstrate the thoroughness and appropriateness of the audit procedures. The requirement for written audit reports is identified as an essential element of an effective auditing program by a number of authors, including Bleiweiss (10:16), Reed (30:115), Hedstrom et al (25:12) Thurman (37:711) and Elkington (20:19).

Corrective Actions. Corrective actions need to be clearly identified. In some cases, design and development work may be required to fully identify and implement the corrective actions. Schedules for their implementation need to be prepared, as well as the identification of the resources required for implementation. Ongoing monitoring and evaluation of the implemented corrective actions are

also necessary to ensure adequacy and effectiveness in achieving the required improvement in environmental performance. The importance to the success of an effective auditing program of properly identifying and following through on corrective actions is identified by a number of authors, including Bleiweiss (10:16), Reed (30:115), Thurman (37:711) and Hedstrom et al (25:13).

Quality Assurance. Quality assurance procedures are necessary to ensure that the environmental audits are both accurate and thorough. This is identified as an essential element of an effective auditing program by a number of authors, including Bleiweiss (10:16) and Elkington (20:19).

Given the many potential benefits which can be achieved through the implementation of an effective environmental compliance auditing program, it is important to "be alert to preventing the practice from degenerating into a public relations and rubber stamping exercise" (30:116).

The review of the literature on environmental compliance auditing detailed above identified nine essential characteristics required for an effective environmental auditing plan. These nine essential characteristics are summarised in Table 1.

EPA Environmental Auditing Policy Statement. The EPA Environmental Auditing Policy Statement, published in 1986, included an appendix entitled "Elements of Effective Environmental Auditing Programs" (22:25008). This listed

TABLE 1

ESSENTIAL CHARACTERISTICS FOR AN EFFECTIVE ENVIRONMENTAL AUDITING PLAN

| | |
|---|---|
| 1. | Top Management Support |
| 2. | Commitment to Follow-up on Findings |
| 3. | Independent Auditors |
| 4. | Adequate Staffing and Training of Auditors |
| 5. | Establishment of Clear and Specific Program Objectives |
| 6. | Clearly Defined Procedures |
| 7. | Written Audit Reports |
| 8. | Clearly Identified Corrective Actions |
| 9. | Quality Assurance Procedures |

seven elements which the EPA considered should be included in any effective environmental auditing plan. These seven elements, which include all of the nine essential characteristics identified above from the review of the general literature, are listed as:

a. Explicit top management support for environmental auditing and commitment to follow-up on audit findings [Top management support, and commitment to follow-up on findings].
b. An environmental auditing function independent of audited activities [Independent auditors].
c. Adequate team staffing and auditor training [Adequate staffing and training of auditors].
d. Explicit audit program objectives, scope, resources and frequency [Establishment of clear and specific program objectives].
e. A process which collects, analyzes, interprets and documents information sufficient to achieve audit objectives [Clearly defined procedures].
f. A process which includes specific procedures to promptly prepare candid, clear and appropriate written reports on audit findings, corrective actions, and schedules for implementation [Written audit reports, and clearly identified corrective actions].

g. A process which includes quality assurance procedures to assure the accuracy and thoroughness of environmental audits. Quality assurance may be accomplished through supervision, independent internal reviews, external reviews, or a combination of these approaches [Quality assurance procedures]. (22:25008)

Summary

As a consequence of growing public awareness of environmental issues in Australia, governments at all levels have moved to adopt new environmental policies and to enact legislation which at least partly addresses public environmental concerns. This has resulted in the introduction of a considerable amount of new environmental legislation in recent years, with no reduction in the amount of new legislation anticipated in the near future.

This situation is similar to that which is occurring in a number of western countries where environmental compliance is becoming increasingly complex as a result of an ever-growing volume of environmental legislation. To achieve and maintain compliance under these circumstances, many organisations around the world are introducing environmental compliance auditing programs. Environmental compliance auditing can be described as a management tool which an organisation uses to carry out a structured and systematic evaluation of its environmental performance.

There are many potential benefits for organisations which conduct environmental compliance audits. These can

include improved working relationships with regulatory authorities; reduced financial liabilities; identification of more efficient operating procedures; avoidance of civil and criminal penalties; early identification of problems; and increased environmental awareness.

In the United States there is no legal requirement for regulated entities to establish and conduct their own environmental auditing programs. Despite this, a number of larger organisations are adopting environmental compliance auditing programs because of the benefits which can be achieved. The USEPA encourages all federal agencies subject to environmental laws and regulations to institute environmental auditing systems. In response, the Department of Defense policy requires all of the constituent elements of the Department to perform self-evaluations for compliance with all environmental laws and regulations. The USAF has achieved this through the introduction of ECAMP, a program of environmental compliance auditing and management aimed at achieving and maintaining compliance with all applicable environmental laws and regulations.

The literature on environmental compliance auditing identifies a number of essential characteristics required for an effective environmental auditing program. These include top management support; commitment to follow-up on findings; independent auditors; adequate staffing and training of auditors; establishment of clear and specific

program objectives; clearly defined procedures; written audit reports; clearly identified corrective actions; and quality assurance procedures.

Proper attention to these aspects of environmental compliance auditing is therefore considered to be essential in the development of any auditing management plan. Accordingly, these elements have been used as a basis for the development of the RAAF EAMP presented in the following chapters.

# III. Methodology

## Chapter Overview

This chapter describes the methodology used to investigate the two research objectives stated in Chapter I:

1. Development of an Environmental Audit Management Plan (EAMP) to meet the specific requirements of the RAAF.
2. Determine what would be required to implement the proposed RAAF EAMP.

A description of the methodology used for the collection of data relevant to the research objectives is provided, along with a description of the methodology used for the analysis of this data to meet the research objectives.

## General Method

Data on the specific RAAF situation and requirements was obtained through the office of the RAAF Director General Facilities - Air Force (DGF-AF). General information on environmental compliance audit management plans was obtained through the literature review detailed in Chapter II. More specific information on the development of audit programs for government agencies was obtained from the USEPA guidelines developed for this purpose. Data on the USAF ECAMP was provided by the faculty of the United States Air Force Institute of Technology (AFIT) School of Civil Engineering and Services. Finally, details of how the USAF

has implemented ECAMP and the resource commitment required to run this program were obtained from HQ USAF, Air Combat Command, and the AFIT faculty.

Justification of Approach

To produce a management plan which truly meets the unique and specific requirements of the RAAF, it is first essential to clearly define these RAAF requirements. For this reason, the determination and clear identification of these requirements was considered to be the essential starting point of the research. All subsequent results were then related to these requirements to check their validity and applicability to the RAAF situation.

The literature review in Chapter II highlighted a number of factors which were consistently identified by authors with experience in environmental compliance auditing as being essential requirements for an effective environmental compliance auditing program. Accordingly, these factors were used as the basis for the development and structuring of the RAAF EAMP. The resulting EAMP was then prepared by combining the RAAF requirements with these previously identified structural elements. In this process, the guidelines prepared by the USEPA for the development of audit programs by government agencies were also considered. As discussed in Chapter I, the USAF program is considered to be an appropriate existing environmental compliance audit

management plan to which the RAAF requirements can be compared, and from which practical guidance for the development of the RAAF EAMP was also derived.

There is a considerable degree of similarity between how the RAAF and the USAF conduct business. There is also some degree of similarity between the USAF ECAMP and the proposed RAAF EAMP. Therefore, examination of how the USAF has implemented ECAMP and the resources required to run ECAMP are considered to be reasonable starting points for determining the requirements for implementation of the proposed RAAF management plan.

Data Collection

The intention of this study was not to generate new data, but rather to collect data which already existed from various sources, and to combine and reapply this data in a new way to meet the objectives of this research and of the RAAF.

As already stated, determination of the RAAF-specific requirements was considered to be the fundamental basis of the research. To determine these requirements, the following data was obtained through the Branch of the RAAF Director General Facilities - Air Force:

a. All Department of Defence (DOD) and RAAF policies and regulations relating to environmental matters.

b. Summaries of all Commonwealth, State and Territory environmental legislation which impact upon RAAF facilities and operations.

c. A listing of those RAAF operations, facilities and processes which are known to pose potential environmental compliance problems.

d. Details of the RAAF Base Tindal Environmental Management Plan.

The following sources of information were reviewed to collect data for determining the framework of an effective environmental compliance audit management plan, and to identify the elements which should be included in such a plan:

a. Literature on the establishment and conduct of environmental compliance auditing, with an emphasis on those elements identified by experienced environmental compliance auditors as being crucial for the effectiveness of such programs.

b. The USEPA guidelines for designing environmental compliance audit programs for federal government agencies, as contained in the USEPA publication "Environmental Audit Program Design Guidelines for Federal Agencies" (21).

c. Details of the USAF ECAMP including:

(i) Air Force Regulation 19-16 Environmental Compliance Assessment and Management Program,

(ii) The Environmental Compliance Assessment and Management Program (ECAMP) Assessment Protocols Manual,

(iii) The AFIT School of Civil Engineering and Services ECAMP Training Manual, and

(iv) The AFIT School of Civil Engineering and Services ECAMP Appendices.

For the purpose of estimating the training and manpower resources which would be required by the RAAF to implement and maintain the EAMP, data on the USAF ECAMP resource requirements was obtained through:

a. HQ USAF.

b. HQ Air Combat Command.

c. AFIT School of Civil Engineering and Services.

In order for a feasible proposal to be developed for the implementation of the EAMP, data was also obtained through DGF-AF concerning:

a. The RAAF organisational structure.

b. RAAF policy development guidelines.

c. RAAF manning policies.

d. RAAF policies on the use of consultants.

e. Financial appropriations.

Data Analysis

The basic framework for the RAAF EAMP was based upon the elements identified in the literature as being essential for an effective environmental compliance audit management plan. The specific requirements associated with environmental auditing programs for government agencies was then obtained from an examination of the USEPA guidelines developed for this purpose. The USAF ECAMP program was also examined to obtain practical guidance concerning an appropriate format. Each of the specific RAAF environmental compliance requirements identified during the data collection phase was then placed within this framework. When appropriate, the RAAF requirements were also compared with the contents of the USAF ECAMP to determine whether similar requirements were addressed within ECAMP. If so, those particular elements of ECAMP were also considered when developing the relevant component of the EAMP. The result of this process was the preparation of the RAAF EAMP.

The data collected on the implementation and operation of the USAF ECAMP, specifically in the areas of functional responsibility and management, development of policies and

regulations, and procedures and guidelines for the conduct of audits, was then reviewed as a basis for identifying the RAAF requirements in these areas. Where applicable, this information was adapted to fit the specifics of the RAAF EAMP, taking into account other factors such as the RAAF organisational structure and RAAF requirements concerning the development of policy guidelines and procedures.

Based on the data collected on the level of resources required by the USAF to both initially implement and then operate the ECAMP, in terms of training, manpower and financial requirements, an estimate was developed for the RAAF's requirements in these areas. This was achieved by comparing the size of the USAF effort to that which would be required by the RAAF (in terms of number of bases, sizes of bases, and differences between the EAMP and the ECAMP), resulting in an estimate of the RAAF's training and manpower requirements. Based on these figures, and Australian cost data, an estimate of the financial resources required to implement the RAAF EAMP was developed.

With the resource requirements identified in this manner, RAAF policies concerning manning, use of consultants, and financial appropriations and delegations were examined to allow identification of a feasible proposal for the implementation of the EAMP.

Summary

Each of the research objectives is restated below, followed by a synopsis of the data collection and analysis associated with achieving each of the objectives:

1. Development of an EAMP designed to meet the specific requirements of the RAAF.

The RAAF-specific requirements were obtained through the collection and analysis of data from Australia, including Australian environmental legislation and DOD/RAAF policies and regulations. From the literature review in Chapter II, the essential elements of an effective environmental compliance audit management plan were identified. These were used, in conjunction with the USEPA design guidelines for the development of audit programs for government agencies, to guide the development of the RAAF EAMP. The RAAF-specific requirements were then placed within this framework. The USAF ECAMP was also used as a practical example of an existing audit management plan to provide further guidance in the development of the RAAF EAMP.

2. Determine what would be required to implement the proposed EAMP.

Data on the implementation and operation of ECAMP was collected and analysed in the areas of management of the program, training, manpower, and financial resources. This information was then used to develop estimates of the RAAF resource requirements associated with implementation of the

EAMP, taking into account scale differences between the RAAF and the USAF. Based upon these estimates of the RAAF resource requirements, a proposal for implementing the EAMP was developed.

# IV. Findings and Analysis

## Chapter Overview

This chapter examines the data collected and the findings and conclusions drawn from the analysis of this information, with respect to the two research objectives initially described in Chapter I.

For the development of an Environmental Audit Management Plan for the RAAF, four separate areas of information have been examined and analysed. The first of these areas was environmental compliance auditing in general. This review was detailed in Chapter II. From this review, nine essential characteristics of an effective environmental auditing plan were identified. These essential characteristics, which have been summarised in Table 1, have been used to guide the development of the RAAF EAMP.

From this general overview of environmental compliance auditing, the focus was then narrowed to an examination of the specific requirements associated with environmental auditing programs for government agencies. Information on this subject was drawn from the EPA publication Environmental Audit Program Design Guidelines for Federal Agencies (21).

The focus was then further narrowed to an examination of specific RAAF requirements. Information regarding this area was drawn from Australian environmental legislation,

DOD/RAAF environmental policies, and the RAAF Base Tindal Environmental Audit Plan. The RAAF Base Tindal Environmental Audit Plan is one of ten individual environmental management plans which together form the RAAF Base Tindal Environmental Management Plan.

Finally, the USAF ECAMP was examined as an example of an existing, Air Force-specific environmental compliance auditing program. The information from these four sources has been utilised to formulate an environmental compliance audit management plan which is applicable to, and meets the requirements of, the RAAF.

Information on how the USAF has implemented ECAMP, along with the resources required to implement and operate ECAMP, was then collected and analysed to provide guidance on the level of resources expected to be required to implement the proposed RAAF EAMP.

## Development of an Environmental Audit Management Plan for the RAAF

As discussed above, the development of an Environmental Audit Management Plan for the RAAF was based upon the collection and analysis of four categories of existing information.

Review of Environmental Compliance Auditing Literature. The review of the literature on environmental compliance auditing, as reported upon in Chapter II, identified nine

essential characteristics of an effective environmental auditing plan:

a. Top management support.

b. Commitment to follow-up on findings.

c. Independent auditors.

d. Adequate staffing and training of auditors.

e. Establishment of clear and specific program objectives.

f. Clearly defined procedures.

g. Written audit reports.

h. Clearly identified corrective actions.

i. Quality-assurance procedures.

These nine characteristics have been used to guide the development of the RAAF EAMP, with the RAAF-specific requirements placed within this framework.

Environmental Audit Programs for Government Agencies. The United States Environmental Protection Agency publication Environmental Audit Program Design Guidelines for Federal Agencies, dated August 1989, is a comprehensive guidance document for the design and establishment of environmental auditing programs for government agencies. The primary purpose of the guidelines is to provide "information, criteria and direction to Federal agencies who are designing environmental audit programs for facilities that they own or operate" (21:3). These guidelines specifically address the unique requirements associated with

environmental compliance auditing by government agencies. Throughout the remainder of this paper, this document shall simply be referred to as the EPA Design Guidelines.

The Requirements of the RAAF. Information relating to the specific requirements of the RAAF was drawn from a number of sources. These included individual DOD and RAAF policy letters and Air Force instructions relating to environmental matters. The draft document Framework for Pollution Control (7), dated March 1990, was prepared for the RAAF by the Australian Construction Services and was used to obtain details of Australian environmental legislation. This document lists and summarises the relevant portions of Commonwealth, state and local legislative requirements, guidelines and codes which are applicable to the various RAAF bases and facilities. New environmental legislation enacted since the preparation of this document has not been considered in this study. However, there will be a requirement to update this document prior to introducing an environmental audit management program. This information will also need to be periodically updated once a program has been implemented.

Information on environmental compliance auditing for the RAAF was also drawn from the document RAAF Base Tindal Environmental Management Plan (28). This document, dated October 1987, was prepared for the RAAF by the consultant Kinhill Engineers Pty Ltd. The RAAF Base Tindal

Environmental Management Plan is currently the only comprehensive environmental management plan for a RAAF base. RAAF Base Tindal was constructed in the mid 1980s, and as part of the planning for this base, a number of environmental studies were conducted. These studies formed the basis of the Environmental Impact Statement (EIS) for this project. As stated in the introduction to the management plan,

> the EIS, together with the two resultant assessment reports (Department of Home Affairs and Environment, 1984; Conservation Commission of the Northern Territory, 1984), committed the Department of Defence to a range of actions deemed necessary to mitigate potentially adverse environmental effects resulting from the construction and operation of the Base. These actions have been compiled into an Environmental Management Plan (EMP). (28:1-1)

As already noted, the Environmental Management Plan is made up of ten individual management plans, one of which is the Environmental Audit Plan. Again, this is the only environmental audit plan in the RAAF, and it is specific to the requirements of this one new and relatively unique base. However, this audit plan does provide a valuable basis for determining some of the requirements of a RAAF-wide environmental audit management plan and has therefore been used as a major input to the design of the RAAF EAMP.

The USAF ECAMP Program. Details of the USAF ECAMP program were obtained primarily from Air Force Regulation 19-16, Environmental Compliance Assessment and Management Program (19). This regulation "establishes the

Environmental Compliance Assessment and Management Program (ECAMP) and assigns responsibilities" (19:1). The introduction to this regulation describes ECAMP as

> a comprehensive self-evaluation and program management system for achieving, maintaining, and monitoring compliance with environmental laws and regulations through the use of environmental compliance evaluations and management action plans at Air Force installations. (19:1)

In addition to AFR 19-16, information on ECAMP was also obtained from the Environmental Compliance Assessment and Management Program (ECAMP) Assessment Protocols Manual (39), and the AFIT School of Civil Engineering and Services ECAMP Training Manual (5) and ECAMP Appendices (4).

Each of the nine essential characteristics or elements of effective environmental compliance auditing, as previously identified, are discussed in detail in the following sections of this paper. All information from the above sources, as it applies to each of the nine elements of effective environmental compliance auditing, has in turn been identified and discussed. This information has then been compared and analysed to make recommendations concerning the development of the RAAF EAMP.

## Top Management Support

From the literature review in Chapter II, the explicit support and backing of the upper management of an organisation is considered to be essential to the success of any environmental compliance auditing program.

EPA Design Guidelines. The EPA Design Guidelines state that

> the effective implementation of an audit program is not possible without strong support and involvement of both line [missions operations managers] and staff [technical specialists] personnel ... Line personnel support should be demonstrated by an explicit written commitment for the auditing program, provision of resources to conduct the program, and budgeting tied to the ... planning process ... to make corrective actions. Staff personnel support, particularly at the audited facility, is essential to maintain a cooperative and non-adversarial relationship between auditors and operators. (21:8)

The EPA Design Guidelines also make the point that

> for an audit program to be successful, senior line managers (to whom even the audit program staff may report) must accept environmental compliance as part of the cost of doing business, i.e., as part of achieving the agency's overall mission. (21:34)

RAAF Base Tindal Environmental Audit Plan. The Tindal Environmental Audit Plan stresses the importance of the environmental audit being "seen as a management tool and as a component of overall Base operations that makes a positive contribution to the achievement of environmental objectives" (28:1-1).

USAF ECAMP. As already noted in Chapter I, the second of the five specific environmental goals outlined for the USAF in 1991 by the Chief of Staff was to "ensure our present operations comply with all federal, state and local environmental standards. No notices of violation is the measure of merit" (29:1). Again, as noted in Chapter I, the Chief of Staff also stated,

> proper attention to the environment today will ensure that we can perform our mission in the future. I expect the Air Force to lead the DOD in environmental protection and compliance. (29:1)

These policy statements by the USAF Chief of Staff clearly demonstrate the commitment and support at the highest level of management within the USAF for effective environmental compliance management. Clear policy guidance for the requirement to implement and conduct environmental compliance auditing throughout the USAF is contained in Air Force Regulation 19-16, dated 24 August 1990 (19).

Commitment to Follow-up on Findings

Just as upper management support for an auditing program is essential, so is the commitment of the upper management to follow through on the findings of the audits. Follow-up procedures should be formalised and responsibilities and accountability for these activities clearly established.

EPA Design Guidelines. The EPA Design Guidelines note that "too frequently, deficiencies cited during an audit are not corrected because they 'fall through the crack'" (21:43). The EPA recommends that the introduction of an automated tracking system "should be a long-term objective of any successful audit program" (21:43). Follow-up audits which check on the progress of remedial action may sometimes be required. The EPA makes the point that

> even though the presence of an audit team tends to highlight agency management's concern for environmental compliance, the follow-up audit should be used primarily as an opportunity to assist the facility in correcting an underlying environmental problem. (21:45)

However, the EPA also notes that in the case of a facility which has a history of repeat findings and which is reluctant to take action to remediate the problem, then follow-up audits are unlikely to resolve this problem. In this situation,

> the agency has a facility management problem that must be addressed and resolved through line management channels. This situation may also require the intervention of someone located sufficiently high in the chain-of-command to compel resolution of the problem. (21:45)

RAAF Base Tindal Environmental Audit Plan. The Tindal Environmental Audit Plan notes that in follow-up audits, "the recommendations from previous audits and the status of their implementation should be subject to inspection" (28:2-5).

USAF ECAMP. AFR 19-16 details the requirements for follow-up action on ECAMP findings. The installation Environmental Protection Committee (EPC) is responsible for reviewing the findings and for developing a "Management Action Plan that addresses all unresolved findings" (19:11). The installation EPC is also responsible for monitoring the status of all open action items, with completed action items required to be reported and documented at EPC meetings (19:12).

Independent Auditors

The literature review in Chapter II indicates that for an auditing program to be successful, there is a need for the auditors to be independent of the audited activities and facilities.

EPA Design Guidelines. As noted in the EPA Design Guidelines, federal agencies are generally divided into national, regional and local offices. In the case of the RAAF, this hierarchy consists of a Headquarters, Commands, and individual bases. As stated by the EPA,

> Environmental compliance issues are most visible at the local level, and thus in the past, many agencies have managed environmental compliance in a decentralized fashion. The technical complexity of environmental laws and the extensive funding needed to correct violations and underlying environmental problems now necessitates environmental management expertise at all levels of an agency. (21:9)

The EPA Design Guidelines state that when choosing the organisational focus of an environmental audit program, it is necessary to ensure an auditor's "objectivity and unobstructed inquiry, observation and testing" (21:9). The EPA recommends a nationally managed audit program which

> offers the advantage of uniform standards. In addition, if there are national problems, an audit can be conducted of that particular problem on a national basis. Locally managed audits offer the advantage of [an] understanding of all aspects of a facilit[y's] operations, but do not offer the degree of auditor objectivity afforded by nationally managed audits. (21:9)

Furthermore, the EPA recommends employing the expertise which exists in all levels of the organisation by using the

skills of staff at all levels (21:9). Whilst audits can be conducted using internal staff, contractors, or a combination of both, the EPA suggests that the use of contract personnel can add objectivity to the audit process. However, they also note that this method can result in quality control problems (21:10).

RAAF Base Tindal Environmental Audit Plan. The Tindal Environmental Audit Plan notes that "to be most effective, an audit should be conducted by people external to the Base and with the necessary experience in the relevant environmental issues" (28:1-2). The audit plan lists categories of people suitable for selection as members of an audit team as:

a. experienced RAAF personnel responsible for environmental matters at other bases,
b. experienced Defence personnel with expertise in environmental matters,
c. other Commonwealth Government Department personnel with specific expertise but without a direct role in the issues being audited, and
d. external consultants with the relevant expertise (28:1-2).

The plan further states that "it may be appropriate to have a mix of such people in an audit team" (28:1-2).

USAF ECAMP. AFR 19-16 provides some general guidance concerning the objectivity of the audit evaluation team

members. The regulation states that "the status or organizational focus of environmental evaluators must be sufficient to ensure objective and unobstructed inquiry and observation" (19:9). Furthermore, the regulation adds that "evaluator objectivity should not be impaired by personal relationships, interference with free inquiry or judgement, or fear of potential retribution" (19:9).

Adequate Staffing and Training of Auditors

The literature review in Chapter II identified that an effective auditing program requires adequate staffing, with appropriately trained and qualified audit team members. The level of training and proficiency in auditing needs to be commensurate with the scope and complexity of the audits to be conducted. The auditors need to understand regulatory requirements, organisational policies, relevant environmental control technologies, facility operations and processes, and auditing methods and techniques. Auditors are also required to possess good verbal and written communications skills.

EPA Design Guidelines. As previously noted in the discussion of the requirement for independent auditors, audits can be conducted using internal staff, contractors, or a combination of both. The EPA believes that there are advantages and disadvantages associated with using either internal staff or contractors. For instance, when using

internal staff, particularly in the case of defence personnel or civil servants, personnel ceilings and manning restrictions can be a limiting factor (21:9). However, the incentives and rewards structure of the civil service and the military can also be used to advantage as "performance can be directly linked to the agency's goals" (21:9). In the case of using contract personnel, the EPA notes that this can add objectivity to the audit process, but that quality control difficulties can be a disadvantage associated with this approach (21:10).

The EPA Design Guidelines recommend that as a group, the audit team should posses the following skills and expertise:

a. Interest in and working knowledge of the various environmental pollution control statutes and regulations.
b. Collective knowledge and experience in the efficient and effective conduct of all aspects of a facility's management systems and control.
c. Skills in collecting information, gathering objective evidence, and diplomatic interviewing. (21:26)

The EPA recommends that team members can be drawn from personnel with expertise in one or more of the areas of science, engineering, law, facility management and operations, and auditing (14:30). The EPA also recommends that training for audit staff should be "ongoing and timely so audit procedures and techniques are kept current" (21:26). Where an organisation does not have sufficient internal staff to conduct an audit program, the use of

contract staff with the appropriate expertise can be used to supplement internal staff members to provide a team with the necessary skills and expertise.

RAAF Base Tindal Environmental Audit Plan. As already noted in the discussion of the requirement for independent auditors, the Tindal Environmental Audit Plan recommends that staff for an auditing program can be drawn from experienced RAAF and DOD personnel, other Commonwealth Government Department personnel with specific expertise, and external consultants. Furthermore, a mix of such people in an audit team is suggested as providing an appropriate balance (28:1-2). No guidance on training is provided in the Tindal audit plan.

USAF ECAMP. AFR 19-16 compares favorably with the EPA Design Guidelines in terms of the stated experience and training requirements for evaluators. Specifically, these requirements are that

> evaluators should possess a good working knowledge of the various environmental pollution control statutes and regulations. Collectively, the team must have the knowledge and background required to efficiently and effectively conduct all aspects of an installation evaluation. Team members should also understand appropriate techniques for collecting information and interviewing installation personnel. (19:9)

AFR 19-16 notes that an evaluation team size and composition will need to be "based on the size and mission of the installation being evaluated" (19:9). However, a team size of four to six members is recommended as generally being appropriate for both internal and external evaluations. In

practice however, the team size for conducting audits often exceeds these recommended numbers. The regulation notes that "a broad range of experience is highly desirable for the team" and recommends that consideration should be given to

> using representatives from civil engineering, bioenvironmental engineering, the judge advocate's office, maintenance, supply, transportation, safety, and others that are appropriate. (19:9)

For external evaluations, the use of some contractor personnel and representatives from other installations are recommended for consideration. The advantages of having a mixed team composition are listed as:

a. [Provides for the] crossfeed of information between team members who have diversified experience and expertise.
b. Keeps headquarters staff current on what is going on in the field.
c. Provides base level personnel an opportunity to see how other bases are solving problems they may have at their home base.
d. Improv[es] internal evaluation quality and environmental awareness at the base level through the experience base personnel gain from serving on an external evaluation team.
e. Improves overall experience and awareness of Air Force personnel.
f. Provides contractor technical expertise to team.
g. Less costly than a largely contractor effort. (19:9)

For internal evaluations, the inclusion of end users on the team is strongly encouraged. This allows for greater confidence in the results, demonstrates that environmental programs are a user responsibility to implement, increases knowledge and understanding of regulatory and Air Force

requirements, and allows for immediate correction of minor problems identified (19:10).

Establishment of Clear and Specific Program Objectives

From the literature review in Chapter II, program objectives need to be clearly and explicitly stated, should include details of the scope of the program and the frequency of audits, must be realistic in terms of the resources required, should be applied on an organisation-wide basis, and need to be communicated throughout the entire organisation.

EPA Design Guidelines. The EPA Design Guidelines state that "to be relevant and responsive to an agency's needs, it is very important that the audit program objectives reflect the agency's mission and its internal environmental policies" (21:8). The Guidelines further add that

> the manager of an environmental audit program must clearly articulate the program objectives for all elements of the agency's mission, and continually focus the organization towards achieving the desired goals. (21:8)

The EPA Design Guidelines identify a number of typical short-term and long-term audit program objectives which are often applicable to federal agencies. Included among the typical short-term objectives are:

a. Verify compliance with laws and regulations.
b. Help facility management understand and maintain environmental compliance.
c. Increase environmental awareness and help facility management understand regulatory requirements.

d. Collect environmental baseline information.
e. Identify remediation projects. (21:16)

Included among the typical long-term objectives are:

a. Eliminate underlying environmental problems.
b. Discover conditions that may present serious risks or have an adverse impact on the agency, personnel or the environment.
c. Evaluate effectiveness of the internal environmental management program.
d. Identify patterns of environmental problems among facilities. (21:16)

RAAF Base Tindal Environmental Audit Plan. The objectives of the Tindal Environmental Audit Plan, as stated in the RAAF Base Tindal Environmental Management Plan, are:

1. Verify compliance with the Environmental Management Plan by ensuring that:

a. commitments made are implemented,

b. environmental standards are met, and

c. relevant procedures are in place and being followed.

2. Identify changes or additions to procedures that might be required to:

a. ensure compliance with the Environmental Management Plan,

b. provide more effective ways of achieving environmental objectives,

c. overcome environmental problems not previously recognized,

d. eliminate unnecessary requirements, and

e. adjust staffing or organizational arrangements (28:1-1).

USAF ECAMP. The objectives of ECAMP, as contained within AFR 19-16 and as already noted in Chapter II, are as follows:

a. Improve Air Force environmental management worldwide.
b. Improve Air Force environmental compliance and compliance management in the United States and Possessions.
c. Build supporting financial programs and budgets for environmental compliance requirements.
d. Ensure that MAJCOMs, installation commanders, environmental protection committees, environmental coordinators, bioenvironmental engineers, and natural resource managers environmental programs are effectively addressing environmental problems that could:
   (1) Impact mission effectiveness.
   (2) Jeopardize the health or safety of Air Force personnel or the general public.
   (3) Significantly degrade the environment.
   (4) Expose the Air Force and its people to avoidable financial liabilities as a result of noncompliance with environmental requirements.
   (5) Erode public confidence in the Air Force and the defense establishment.
   (6) Expose individuals to civil and criminal liability.
e. Anticipate and prevent future environmental problems. (19:3)

The objectives of a particular environmental audit program need to be considered when determining the scope of the program and also the frequency with which audits are to be conducted. The scope and frequency should both reflect the requirement to effectively achieve the objectives of the program.

Scope of Environmental Audit Programs. The EPA Design Guidelines identify three levels of environmental auditing programs, designed respectively to

> verify compliance with environmental requirements; evaluate the effectiveness of environmental management systems already in place; or assess risks from regulated and unregulated materials and practices. (21:19)

The EPA "considers any one of these levels to be acceptable in terms of meeting its basic definition of an acceptable audit program" (21:19). Furthermore, the EPA suggests that "initiating a new audit program aimed at all three levels of activity - compliance, management and liability - may be too ambitious at first" (21:19) and suggests that phasing in one level at a time should be considered (21:19).

Frequency of Audits. An effective auditing program requires periodic auditing rather than a one-time audit only. A number of organisations, including the USAF, conduct audits of their facilities on an annual basis. However, the frequency with which an organisation conducts audits will be dependent upon a number of factors, including the environmental risk level, the type of facilities, and staffing constraints (21:27). The EPA Design Guidelines list a number of factors which contribute to determining the environmental risk level, including:

a. Size of a facility.
b. Geographic location of a facility, including proximity to population centers.
c. Relationship to environmentally sensitive areas.

d. Complexity of the activities and operations,
e. Volume and characteristics of emissions, effluent, or stored materials.
f. Whether problems of a serious nature have been found at the facility.
g. Past compliance history. (21:28)

A survey by the USEPA of federal agency audit programs found that typically a facility is audited every two to three years (21:28). In the case of the USAF, an internal environmental compliance audit is conducted for each facility on an annual basis, except in those years when an external audit is conducted. External environmental compliance audits are carried out by the USAF at each facility at least once every three years.

Clearly Defined Procedures

From the literature review in Chapter II, clearly defined audit procedures were found to be an essential element of an effective auditing program. Procedures for conducting the physical inspections, conducting interviews, collecting information, and analysing and interpreting the information should be included to achieve the objectives of the auditing program. Checklists and audit protocols are often used to provide guidance to the audit team.

EPA Design Guidelines. The EPA Design Guidelines state that "an audit program needs to have technical criteria for environmental problems to be identified" and that "criteria also [are] needed so information gathered during an audit is sufficient, reliable, relevant, useful and a sound basis for

audit findings and recommendations" (21:23). The use of audit protocols is identified as an effective method for systematically listing these criteria. The EPA describes this as follows:

> Protocols are a step-by-step instruction for who to talk to, what to look for and questions to ask to identify environmental problems. Protocols are more than a mere checklist for identifying compliance problems. Protocols are designed to provide detailed instructions for qualified individuals to follow in conducting environmental audits. (21:23)

The EPA has also published a document entitled Generic Protocol for Environmental Audits at Federal Facilities which can be used as a basis for the establishment of specific environmental protocols for a particular organisation. Figure 1 is an example of an audit information source list from this document, and Figure 2 is an example of an auditor's checklist. The EPA also provides instructions for the modification of these generic protocols to meet organisation-specific requirements:

a. Determine media to be covered and priority topics within each medium based on the scope and frequency of the audit.
b. Identify and list Federal, State and local regulatory requirements. Revise the protocol checklist to reflect what to audit at your facility.
c. Review internal agency regulations, directives and standard operating procedures, and decide which if any of these you want to add to the protocol.
d. Identify any additional management issues or practices to audit.
e. Revise the source list of records to review, physical features to inspect and people to interview. (21:23)

The EPA also recommended that an organisation should "plan on updating its protocol periodically to keep current with audit techniques and new regulations" (21:23). A schematic overview of this process, in terms of the overall structure of an environmental compliance audit, is presented in Figure 3.

RAAF Base Tindal Environmental Audit Plan. The Tindal Audit Plan details the steps which should be taken when conducting an environmental audit. These are listed as:

a. Prepare to conduct the audit.

b. Meet with the base commander at the outset of the audit review.

c. Collect background information required to perform the audit.

d. Conduct the inspection of the base.

e. Meet with appropriate environmental agencies.

f. Review the results of the audit with base environmental personnel.

g. Meet with the base commander to summarise the results and findings of the audit.

h. Prepare the audit report.

i. Implement remedial actions and follow-up (28:1-3).

For the base inspection phase, the Tindal Audit Plan provides checklists for the following nine protocol areas:

a. Design, Construction and Maintenance.

b. Rehabilitation.

# AUDIT INFORMATION SOURCE LIST

PCB MANAGEMENT

## Activity: PCB Management

### Records to Review:

- Inspection, storage, maintenance and disposal records for PCBs/PCB items
- PCB equipment inventory and sampling results
- Correspondence with regulatory agencies concerning PCB noncompliance situations
- Annual documents.

### Physical Features to Inspect:

- PCB storage areas
- Equipment, fluids and other items used or stored at the facility that contain PCBs.

### People to Interview:

- Environmental Compliance Coordinator
- Facilities Manager
- Electrical Maintenance Staff.

Figure 1. Example of an Audit Information Source List (21:24)

**Activity: PCB Management**

| Regulatory Citation | Auditors' Checklist | Comments | Finding Number |
|---|---|---|---|
| 40 CFR 761.65 | **Storage of PCB Items for Disposal:**<br>• PCB items are inspected every 30 days for leaks.<br>• PCB items are stored in DOT-approved containers.<br>• Moveable equipment used to handle PCB items is decontaminated prior to leaving storage area.<br>• Stored PCBs and PCB items are disposed of within one year from date they were placed in storage.<br>• *Storage area is managed so that* PCB containers can be located by the date they are initially entered into storage.<br>• Long-term storage facilities (between 30 days and one year) meet the following requirements:<br>- Roof and walls of the facility prevent rainwater from reaching PCBs and PCB items<br>- The floor has continuous curbing (minimum 6 inches)<br>- The floor and curbing are made of continuously smooth and impervious materials such as Portland cement or steel | | |

Figure 2. Example of an Auditor's Checklist (21:25)

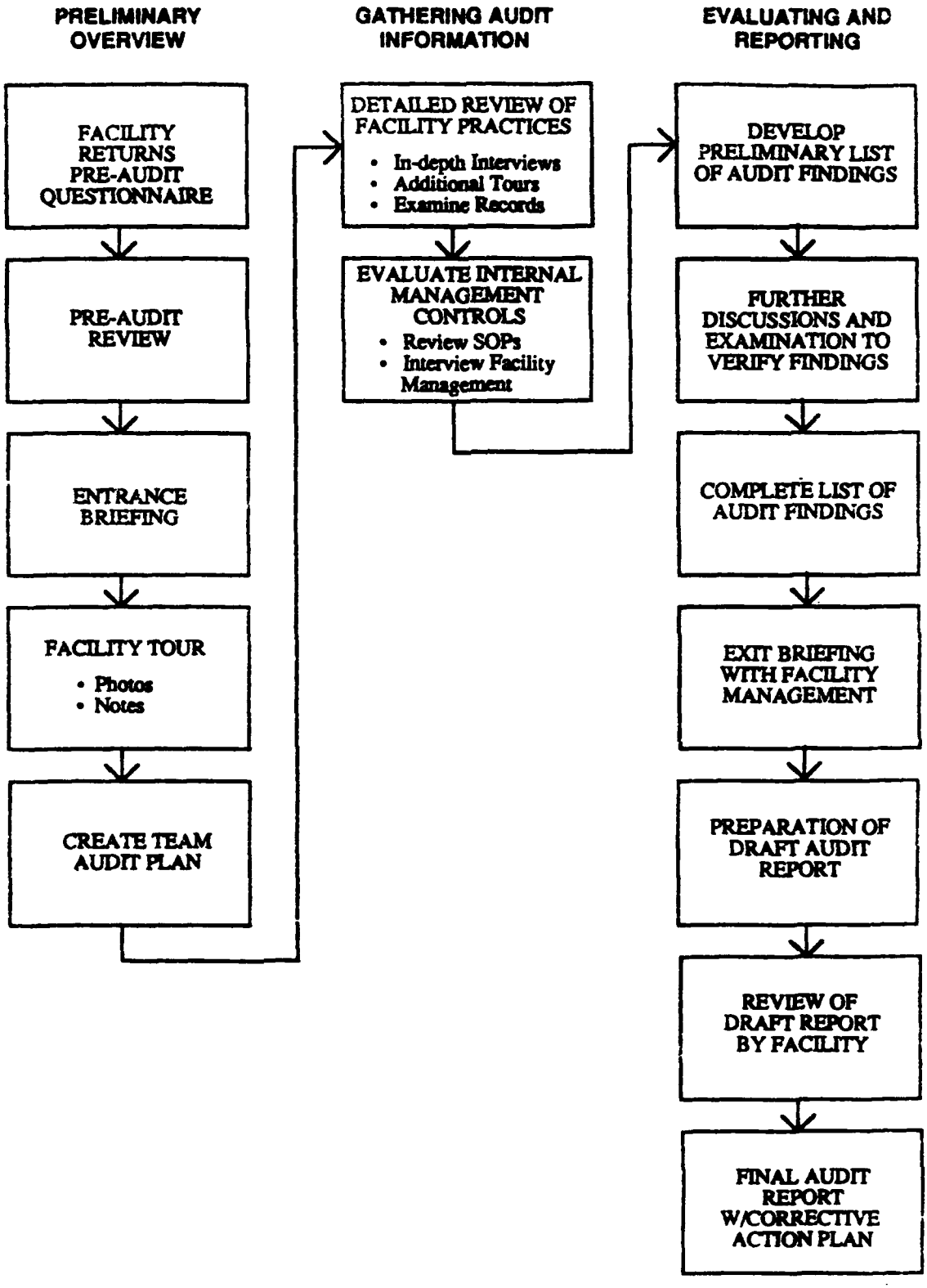


Figure 3. Schematic Overview of the Audit Process

(21:20)

c. Buffer Zones and Air Weapons Range.

d. Noise Control.

e. Social Issues.

f. Water Quality.

g. Bird Strike Mitigation.

h. Mosquito Control.

i. Environmental Contingency (28:3-1).

USAF ECAMP. AFR 19-16 details the procedures which are set down as the minimum requirements for conducting an environmental compliance audit (19:10). These are listed as:

a. Pre-Evaluation Activities:

(i) Pre-visit questionnaire,

(ii) Define evaluation scope and team responsibilities,

(iii) Review relevant regulations,

(iv) Review evaluation protocols, and

(v) Develop evaluation schedule.

b. On-Site Evaluation:

(i) In-brief with the installation Environmental Protection Committee,

(ii) Provide regular feedback to the installation environmental coordinator and the evaluated activities,

(iii) Action to be taken to immediately initiate corrective actions for significant findings,

(iv) Team members to record their findings on a daily basis, and

(v) All findings to be validated with responsible base individuals during the on-site evaluation.

c. Outbrief and Preliminary Environmental Findings.

d. Preliminary Environmental Findings Review.

e. Management Action Plan and Comments on the Preliminary or Candidate Environmental Findings.

f. Draft Final Environmental Evaluation Report.

g. Final Environmental Evaluation Report.

h. Follow-up.

ECAMP uses ten environmental protocols, the details of which are contained within the publication Environmental Compliance Assessment and Management Program (ECAMP) Assessment Protocols (39) dated January 1991. The protocols are:

a. Air emissions,

b. Hazardous materials management,

c. Hazardous waste management,

d. Natural and cultural resources management,

e. Noise management,

f. Pesticides management,

g. POL management (including underground storage tanks),

h. Solid waste management,

i. Special programs (including PCBs, asbestos, radon gas, installation restoration program, pollution abatement plan, and environmental impact analysis process), and

j. Water quality (including drinking water and waste water discharge).

Written Audit Reports

Written audit reports are an essential element of environmental compliance auditing. The reports need to be prepared promptly and should be clear, accurate, informative and honest. The report should include sufficient documentation to support the audit results and to demonstrate the thoroughness and appropriateness of the audit procedures.

EPA Design Guidelines. The EPA Design Guidelines recommend that the final audit report should be "a summary of findings and recommendations grouped by major environmental areas. Deficiencies should be ranked in priority order" (21:37). The EPA guidelines also stress the importance of a well-written report which can be readily understood. Clean and concise writing should be used and the report should be as factual and specific as possible (21:37).

The EPA also recommends the use of an automated tracking system and report generator. However, while the

EPA suggests that automation should be a goal of all audit programs, it also recommends that "a year or two of written reports may give the reporting format the time needed to evolve into what is desired in the form of computer-produced reports" (21:38).

The EPA advises that a distribution plan is necessary to provide for review and incorporation of comments into the draft audit report. The audited facility should be included in this distribution to provide a check on the accuracy of the report. Small problems identified by the audit should be fixed and larger deficiencies scheduled for remedial action before the report is finalised and distributed (21:38). The EPA notes that "an audit can generate significant amounts of sensitive information" (21:38) and that the audit team should therefore "make their observations, findings or recommendations as objective as possible" (21:38). Government organisations should also be aware of the provisions of the Freedom of Information Act, which can result in the public release of audit reports. However, as noted by the EPA, "if top management supports the audit program and has made a commitment to promptly correct problems, the sensitivity of the audit results will be minimized" (21:40).

RAAF Base Tindal Environmental Audit Plan. The Tindal Audit Plan recommends that the audit report should "cover the scope of the work undertaken in the course of the audit,

the findings of the audit (positive and negative) and the recommendations" (28:1-3). In particular, the audit report is to include an introduction, the scope of the audit, a review of audit findings, recommendations, and technical data included as appendices (28:2-5).

USAF ECAMP. AFR 19-16 provides details of the required content and format of ECAMP evaluation reports. Chapters required in the evaluation report include an executive summary, background and scope, environmental compliance status, environmental practice issues, and a management action plan (19:12). Initially, the evaluation team is required to prepare a Preliminary Environmental Findings Report. The installation EPC is then required to review the Preliminary Environmental Findings Report to provide comments and any factual corrections that may be required. In addition to reviewing the Preliminary Environmental Findings report, the installation EPC is also responsible for developing a Management Action Plan which addresses all of the findings. This Management Action Plan is required to track each of the audit findings. Once the installation EPC-produced comments and Management Action Plan are available, the audit team then produces a Draft Final Environmental Evaluation Report. This is forwarded to the installation EPC for approval in the case of internal reports, or to the appropriate major command headquarters (MAJCOM) for approval by the MAJCOM EPC in the case of

external reports. Following this approval, the report becomes the Final Environmental Evaluation Report (19:11).

Clearly Identified Corrective Actions

Corrective actions need to be clearly identified including, where necessary, sufficient design and development work to allow full identification. Schedules for the implementation of corrective actions need to be prepared, resources allocated, on-going monitoring continued until their completion, and the effectiveness of the completed actions evaluated to ensure adequate performance.

EPA Design Guidelines. The EPA Design Guidelines note that before the audit report is returned to the audited facility, "the findings must be analyzed and recommendations for remedial action clearly stated for easy implementation" (21:41). Categorisation and ranking of the audit findings is recommended. Suggested categories include the grouping of findings based on regulatory requirements, organisational policies, professional practice, local conditions or public perceptions (21:41). Possible methods for assigning priorities to audit findings range from simple decision trees to more complex matrices with assigned point factors. The EPA guidelines note that any such methods need to incorporate the following criteria:

a. Consistency of application,

b. Address factors of interest to management, and

c. Document priority designation (21:42).

The EPA guidelines describe some of the benefits of priority schemes, including the fact that they

> assist audit program managers in designing subsequent audits and status reviews or help identify changing conditions, for example, more low priority findings with decreasing high priority findings over time. A priority scheme also assists in using audit reports to evaluate the effectiveness of the overall agency environmental compliance program. (21:42)

Possible methods for ranking findings include assigning priorities according to:

a. Authority establishing the requirement, such as Federal and State laws, regulations, permits, interagency agreements; or agency environmental management program.
b. Probability and severity of hazard identified and its effect on human health and the environment.
c. Reporting requirements and potential enforcement penalties associated with a finding. (21:42)

Another method discussed in the guidelines for ranking findings is to set priorities so that "environmental control projects are completed as required to meet statutory and regulatory requirements" (21:42). The focus of this method is to assign the highest priority to those findings for which a facility is either out of compliance, or will go out of compliance if remedial action is not taken (21:42).

An effective audit finding tracking system is an essential element of an auditing program. The benefits of an effective tracking system, as described by the EPA guidelines, include:

a. Specific future actions occur as scheduled.

b. A record is maintained documenting when an action was fixed.
c. The present status of an action may be determined.
d. Incomplete remedial actions may be added to future audits. (21:43)

The types of information which would normally be contained in an audit tracking system include:

a. Description of [the] finding.
b. Date of [the] audit that uncovered the problem.
c. Responsible manager.
d. Audit responsible for [the] finding.
e. Description of remedial action.
f. Milestones in [the] remedial action plan.
g. Estimated resources ... to properly address [the] problem.
h. Funding priority.
i. Status. (21:44)

The EPA guidelines realistically note that lengthy delays can often occur in rectifying noncompliant situations at federal facilities due to programming and funding constraints. They also make the point that "with the exception of de minimus findings, e.g., changes in records management or posting of signs, most remedial actions require significant capital expenditures" (21:45). However, the audit report does act to justify and defend funding requests and can often be instrumental in elevating the funding priority of environmental deficiencies.

RAAF Base Tindal Environmental Audit Plan. The Tindal Audit Plan tasks the base level personnel with the responsibility for considering and putting into practice the recommendations of the audit report. The audit plan also notes that "where deviations from these recommendations occur, it is appropriate for Base personnel to document the

reason for such deviations" (28:2-5). The recommendations from previous audits and the status of their implementation should be checked in subsequent audits to ensure their adequacy (28:2-5).

USAF ECAMP. AFR 19-16 tasks the installation EPC with the responsibility for monitoring the status of all open action items. As action items are completed, they are required to be reported and documented at installation EPC meetings (19:12).

Quality Assurance Procedures

Quality assurance procedures are required to ensure that the environmental audits are both accurate and thorough.

EPA Design Guidelines. The EPA Design Guidelines recommend that quality assurance can be "accomplished through supervision, independent internal reviews, or a combination of these approaches" (21:49). Whilst program evaluation and quality assurance can be continuous, it is suggested that this activity "is particularly valuable after completing a distinct phase of the audit task" (21:49). This periodic evaluation of the effectiveness of the audit program should focus on technical performance, program component integrity, and environmental compliance results (21:49).

Technical performance relates to the quality of the data collection and report writing. According to the design guidelines

> the data collected during the audit should be appropriate to the scope of the audit, be as complete as possible, be traceable to their source and be comparable among all individuals involved in the audit. (21:49)

Furthermore, the EPA guidelines state that

> the quality of a written document can be judged by whether it presents technically accurate information, addresses objectives of the audit and is organized in a clear, consistent and logical manner. (21:50)

Program component integrity refers to all components of an audit program being relevant to the "needs of the audited facility and to the environmental management program" (21:50). One method for checking this is the use of audit appraisal questionnaires which are completed by the audited facilities. To illustrate this method, the audit appraisal questionnaire used by the Tennessee Valley Authority environmental audit program is shown at Figure 4. Another method is for members of the audit team, or other personnel involved in the audit program, to evaluate the process and to use their experience to make adjustments and improvements where possible (21:50).

The authors of the EPA Guidelines acknowledge that measuring environmental compliance results can be difficult, but recommend that an attempt to do so should be included as part of the overall audit program. The number and magnitude of environmental deficiencies identified can be used as a

## Tennessee Valley Authority's Audit Appraisal Questionnaire

Environmental audits are conducted by EQS to inform you and the management of your facility, the General Manager, and the General counsel of the status of environmental compliance at your facility with regard to applicable Federal, State, and local environmental laws and regulations and TVA environmental policies and procedures. While this connotes a policing or oversight function, we view our objectives and role to be one of service to you by providing an independent evaluation of the status of environmental compliance at your facility. We want to let you know how you are doing in complying with environmental requirements. In short, we are not in the business to criticize, embarrass or find fault, but rather to work with you to help TVA attain an exemplary environmental compliance track record.

We are very interested in constructive criticism regarding the effectiveness of the audit program and would like you to complete the attached questionnaire. If the questionnaire does not address your concerns, feel free to list them under "Comments." Please return the questionnaire to the Director of Environmental Quality. Thank you.

Your Name: _____

Position: _____

Organization/Facility: _____

Dates of audit visit: from _____ to _____

Indicate the extent to which you agree or disagree with the following statement by circling the appropriate code, as follows:

| | |
|---|---|
| SA = Strongly agree | D = Disagree |
| A = Agree | SD = Strongly disagree |
| UD = Undecided | NA = Not applicable |

Audit Planning

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | I was given a clear indication of the scope and purpose of the audit before commencement. | SA | A | UD | D | SD | NA |
| 2. | I was given a clear indication of who would receive copies of the report after completion. | SA | A | UD | D | SD | NA |
| 3. | The auditors were prepared and knowledgeable. | SA | A | UD | D | SD | NA |

Audit Conduct

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4. | The audit staff was overly concerned with unimportant or immaterial detail checking. | SA | A | UD | D | SD | NA |
| 5. | The audit did not result in excessive disruption to the operation of this facility. | SA | A | UD | D | SD | NA |
| 6. | This audit was conducted in a professional manner. | SA | A | UD | D | SD | NA |

Figure 4. Example of an Audit Appraisal Questionnaire

(21:51)

Audit Staff

| | | |
|---|---|---|
| 7. | Audit staff had sufficient knowledge and understanding of the work and system of this facility. | SA A UD D SD NA |
| 8. | Audit staff had sufficient technical skills and experience. | SA A UD D SD NA |
| 9. | Audit staff showed a good awareness of current events relevant to this facility. | SA A UD D SD NA |
| 10. | Audit staff showed a good awareness of current events relevant to this facility. | SA A UD D SD NA |
| 11. | Audit staff showed interest and enthusiasm for their job. | SA A UD D SD NA |
| 12. | Audit staff was adequately supervised. | SA A UD D SD NA |

Communication of Results

| | | |
|---|---|---|
| 13. | Audit report was factual and accurate. | SA A UD D SD NA |
| 14. | Audit report contained adequate explanation for the findings and recommendations. | SA A UD D SD NA |
| 15. | There was adequate discussion of the audit report between the auditors and the management of this facility at the exit meeting. | SA A UD D SD NA |
| 16. | Audit report was unduly concerned with trivia. | SA A UD D SD NA |
| 17. | Audit report was useful to the management of this facility. | SA A UD D SD NA |

General

| | | |
|---|---|---|
| 18. | I would recommend that the environmental compliance audit program audit this facility again. | SA A UD D SD NA |
| 19. | If answer to number 18 is yes, how often do you feel your facility should be audited? | Once/Yr. Once/18 mo. Once/2 Yrs. Once/3 Yrs. |

Comments: _____

_____

_____

(Use back of questionnaire if necessary)

Figure 4. Example of an Audit Appraisal Questionnaire (Continued) (21:51)

possible indicator of the success of a program. Evaluation over time of the following audit results and trends is recommended:

a. Regulatory compliance rates based on each environmental media.
b. Regulatory compliance rates based on assigned priorities.
c. Number of regulatory compliance deficiencies identified.
d. Average facility regulatory compliance rates. (21:50)

According to the EPA, "a successful environmental audit program should be reflected in increased regulatory compliance rates" (21:50) on an organisation-wide basis, and that "there should be a direct relationship between an environmental management program's overall success or failure and the effectiveness of the audit program" (21:50). The EPA guidelines further state that

> overall improvement in regulatory compliance should result from an audit program that successfully identifies a facility's or an agency's generic patterns of noncompliance and addresses them effectively. (21:50)

RAAF Base Tindal Environmental Audit Plan. Quality assurance checks of the environmental audit process are not addressed in the Tindal Audit Plan.

USAF ECAMP. Although AFR 19-16 does not specifically address the subject of quality assurance checks, the required format of the environmental evaluation report does provide summaries of information which could be used for this purpose. In particular, tables which summarise the number of noncompliance findings by protocol, and by

compliance area (discharge, potential discharge or administrative), are required to be included as part of the executive summary section of the environmental evaluation report (19:12). Monitoring of this data over time for a particular facility, as well as across all of an organisation's facilities subject to audit, could potentially provide valuable quality assurance information. In the case of ECAMP, this monitoring function is performed by HQ USAF. The overall performance of ECAMP is also subject to periodic evaluations conducted by the Air Force, DOD, and the Inspector General.

Recommendations for the Preparation of the RAAF EAMP

The preceding section identified and discussed information relevant to the preparation of a RAAF EAMP. This information was drawn from four major sources including general literature on environmental compliance auditing, the requirements of environmental auditing programs for government agencies, the requirements of the RAAF, and the USAF ECAMP.

In this section, the above information has been reduced to those specific items which are considered appropriate for inclusion in the RAAF EAMP, and these are presented as a series of recommendations. The recommendations have been grouped according to the nine essential elements of effective compliance auditing previously identified.

Top Management Support. To be successful, the RAAF EAMP will require the explicit support of management at the highest possible level. Accordingly, the direct support and backing of the Chief of the Air Staff (CAS) for the introduction of an environmental auditing program should be sought. To achieve this support, it will be necessary to provide convincing evidence to the CAS as to the benefits which such a program can provide the RAAF. Material contained within this paper could be used to form the basis of a submission to the CAS, seeking approval and support for the proposed program. Subject to the support of the CAS, a RAAF policy directive could be issued to convey to all RAAF members the importance of environmental compliance, the commitment of the RAAF to environmental compliance, and the proposal to introduce a RAAF-wide environmental audit management plan. Once the EAMP has been fully developed and approved, the details for its implementation and operation should initially be promulgated as an Air Force Temporary Instruction (AFTI) (Facilities). Ultimately, these details should be incorporated as a chapter within the RAAF Facilities Manual, DI(AF) AAP 3300.001.

To clearly demonstrate top management support, the EAMP should include details of the resources to be made available to conduct the program, along with details of how corrective actions should be programmed. The EAMP should also clearly convey the message that environmental compliance is the

responsibility of all members of the RAAF, and that full compliance can only be achieved through the commitment and cooperation of all members working together to achieve this goal. Similarly, there is a need to stress the importance of environmental compliance as a necessary part of doing business if the RAAF is to fully meet its national obligation of conducting effective air operations in the pursuit of Australia's defence and national interests. In terms of environmental compliance auditing, the EAMP also needs to stress that the audit activity is a management tool aimed at assisting individual bases to better meet their operational and environmental objectives. The importance of proper attention and regard to environmental matters today, to allow the RAAF to continue to effectively meet its mission in the future, also needs to be strongly emphasised.

Commitment to Follow-up on Findings. As part of the process of obtaining the support of the senior management of the RAAF for an environmental audit program, it will also be necessary to obtain a commitment for the provision of sufficient resources to ensure that the findings of the audits can be adequately addressed. This does not mean a commitment to provide new resources, as this will not be possible in the current fiscal circumstances. What will be required is a commitment to give sufficient priority to the rectification of environmental compliance problems, such that adequate resources can be applied to this task. Most

importantly, there is a requirement that this commitment be adequately conveyed to the entire organisation. This could be achieved by issuing a RAAF policy directive which clearly states the RAAF's commitment to not only identifying, but also to rectifying, all environmental noncompliances.

Procedures for monitoring the rectification of noncompliances should be clearly stated in the AFTI and the Facilities Manual. The responsibilities and accountability for these actions, at each of the Base, Command, and Air Force Office levels, should be clearly stated. Each base should be responsible for tracking the resolution of any noncompliances identified through the audit process. While the base Facilities organisation should be responsible for overall coordination and monitoring, input and assistance from all units on the base will be required if the follow-up and rectification of findings is to be effective. For this reason, each base-level unit should be required to appoint a unit environmental compliance officer (UECO), on a secondary duty basis, who is responsible for coordinating, monitoring, and hastening rectification actions within their individual units. The establishment of an Environmental Management Committee (EMC) at each base, to oversee the monitoring and rectification of noncompliances, or for that matter, any environmental problems or issues, is also highly recommended. This committee would ideally be chaired by a senior base manager, such as the Base Commander or the

Officer Commanding the Base Support Wing. The committee should include representation from all units on the base, preferably at the Officer Commanding and Commanding Officer levels. This committee should be responsible for monitoring all open findings on a regular basis, with all completed findings reported to the committee and documented in the minutes of the committee meetings. This review process by the EMC should take place on at least a quarterly basis. During subsequent audits, progress made towards rectifying previously-identified noncompliances would also be assessed.

At the Command level, the Command Facilities Officer would be responsible for monitoring the performance at each of the bases within the Command, and for the programming and funding of those rectification items which require resources beyond those available at the base level. At Air Force Office, DGF-AF/WMEE would be responsible for policy development, program coordination, monitoring the progress of the RAAF-wide program, monitoring trends, assessing the effectiveness of the overall program, and the programming of funds as required to meet the RAAF's environmental goals.

Independent Auditors. Whilst there is a clear argument for the use of independent auditors who have no direct connection with the audited activities and facilities, this needs to be balanced with the requirement to educate the facility users concerning the importance, relevance, and benefits of environmental compliance, and to encourage their

active involvement in this process. Accordingly, a mix of internal and external audits is proposed. A complete internal audit of all of a base's facilities and operations should be conducted on an annual basis, using personnel available on the base, supplemented with consultants as required for any specialised activities for which particular expertise is not available. This annual internal audit would be overseen by the base Environmental Management Committee, with the base Facilities Officer and the Unit Environmental Compliance Officers responsible for implementation.

In addition to the annual internal audits, less frequent external audits, using completely independent auditors, should also be conducted. At larger bases, such as Amberley, Richmond and Williamtown, these external audits are recommended at three year intervals. For smaller bases, such as East Sale, Pearce and Townsville, an external audit every five years would probably be sufficient. External audits of bases would be coordinated and organised by the relevant Command. External audits could utilise staff from the Command, Air Force Office, other bases, DOD, other Government agencies, and consultants. In most cases, it is envisaged that personnel from most, if not all, of the above categories would be used to form an external audit team. In this way, the expertise which exists at all levels of the RAAF would be utilised, supplemented by specialists from

outside the organisation in those areas in which the RAAF may not have in-house expertise. The use of some auditors from outside of the RAAF also provides the advantage of bringing in new knowledge which can be assimilated by the RAAF. External auditors also offer the advantage of a fresh look at RAAF procedures and operations, without the constraint of preconceived ideas. The use of personnel from other bases encourages the cross-flow of information and ideas between bases, and furthers the goal of enhancing environmental knowledge amongst RAAF personnel. When putting together an audit team, the requirement to select personnel who are in a position to conduct objective and unconstrained inquiry and observation also needs to be considered.

Adequate Staffing and Training of Auditors. For the RAAF to conduct effective internal and external audits using RAAF personnel, there will be a requirement to provide training to ensure an adequate understanding of environmental regulatory requirements, RAAF policies, RAAF facility operations and processes, appropriate environmental control technologies, and basic auditing methods and techniques. Whilst some formalised training may be appropriate for personnel in certain key positions, such as base Facilities Officers and Unit Environmental Compliance Officers, much of the training required could be provided through a broader education and training program aimed at

increasing the level of awareness of environmental issues and compliance by all members of the RAAF. A short training program could be provided for audit team members, or alternatively, on-the-job training could be provided by initially using teams comprised of a mixture of RAAF personnel and experienced auditing and environmental consultants. All subsequent audit teams would then be made up of a mixture of experienced and new team members, to provide for continuous training of personnel in the required skills. Any formalised training programs should, at least initially, be prepared and run by consultants as a contract service, given the RAAF's current lack of in-house expertise in the environmental area. Such training programs should also teach some of the basic techniques for collecting information and interviewing base personnel.

In addition to any formal or on-the-job training of audit team members, the development of clearly defined environmental compliance audit procedures will also be required. This should include the preparation of audit protocols and summaries of the relevant portions of legislative requirements, guidelines and codes as they apply to each RAAF base. The use of such procedures should greatly enhance the efficiency and effectiveness of individual audit team members.

Internal environmental audit team members should be drawn from as wide a cross-section of base activities as

possible, to ensure a wide range of expertise and experience. The inclusion of personnel associated with each of the types of facilities or activities to be audited offers many advantages, including greater credibility, a sound knowledge of the facility operations, increased awareness of regulatory and RAAF requirements, and very importantly, demonstrates that environmental programs are the responsibility of all personnel. However, care needs to be exercised when selecting internal audit team members, to attempt to minimise potential problems with objectivity or bias. The size of audit teams and the time period required to conduct an effective audit will depend upon the size, operations, facilities, and complexities of individual bases. Although these requirements will best be judged over time with actual experience, a reasonable initial estimate of the requirements, for both internal and external audits, is considered to be five to ten team members, for five to ten working days. This will vary from base to base, depending upon the various factors relevant to the particular base.

Establishment of Clear and Specific Program Objectives. The RAAF mission, as stated in the publication Air Force 1992, is to

> conduct effective strategic and tactical air operations as an independent force, or as part of a joint or combined force in the pursuit of Australia's defence and national interests. (31:5)

The objectives of the RAAF EAMP should be aimed at enhancing the RAAF's ability to meet this mission, by ensuring that environmental compliance is managed in such a way that there is no adverse impact upon the RAAF's primary mission effectiveness.

Based upon the USEPA advice to phase in new audit programs one level at a time, the RAAF EAMP should initially concentrate on the first level of compliance auditing, that being verifying compliance with environmental requirements. The subsequent higher levels of auditing, including evaluation of environmental management systems and assessment of risks from regulated and non-regulated materials and practices, can be initiated at a later stage.

Taking into account the environmental risk factors listed by the USEPA, as well as the types of facilities and staffing constraints as they each apply to the RAAF, an external audit of each base on a three to five yearly basis, depending upon the size of the base, is initially proposed. As audits are conducted at each base, and the results of the audits become known, this frequency should be reviewed and modified as required. The external audits should be supplemented by an annual internal audit of each base. This recommendation is supported by the RAAF Tindal Audit Plan, which states that for a base on the scale of RAAF Base Tindal, a total review audit should be held every three to

five years, along with an annual conformance review (28:1-4).

As noted in the EPA Design Guidelines, when establishing a new environmental auditing program, "there are many advantages to having a clear statement of at least a few objectives, which can be added to as the program matures" (21:17). Based upon the above discussion, the following objectives are proposed for the RAAF EAMP:

a. Verify the RAAF's compliance with all applicable environmental laws and regulations.

b. Improve the RAAF's environmental compliance performance.

c. Provide sound environmental management to ensure no adverse impact upon the RAAF's mission effectiveness.

d. Increase environmental awareness within the RAAF.

e. Identify more effective ways of achieving environmental compliance.

f. Identify actions required to improve the RAAF's environmental performance and make provision for their implementation.

g. Identify opportunities for increased efficiency and cost savings which would result from the implementation of pollution prevention practices.

h. Anticipate future environmental issues that may impact the RAAF, thereby eliminating any potential

future adverse impacts upon the RAAF's mission effectiveness.

Clearly Defined Procedures. Clearly defined audit procedures need to be identified in the section of the RAAF Facilities Manual which sets out the EAMP requirements. These procedures will include checklists and audit protocols to provide guidance to audit team members and to facility operators. These protocols should provide detailed instructions for team members to follow when conducting audits. In particular, they should include advice on who to talk to, what to look for, and the appropriate questions to ask to identify any environmental problems or deficiencies. The following audit protocols are considered to be relevant to the requirements of the RAAF:

a. Air emissions management,
b. Water quality management (including drinking water and waste water discharge),
c. Solid waste management,
d. Hazardous materials management,
e. Hazardous waste management,
f. Natural and cultural resources and social issues management,
g. Buffer zone management (including noise, airfield design criteria, and explosive ordnance requirements), and
h. Environmental contingency management.

Examples of audit information source lists and auditor's checklists, based upon the USEPA generic environmental audit protocols, have been prepared for each of the proposed RAAF audit protocols, and are included in the proposed RAAF EAMP at Appendix A.

The steps which should be followed when conducting an audit review should also be specified in the RAAF Facilities Manual. The following sequence of steps are considered to be appropriate for the requirements and resources of the RAAF:

a. Pre-Evaluation Activities:
   (i) Define evaluation scope,
   (ii) Select team and allocate responsibilities,
   (iii) Review relevant regulations,
   (iv) Review evaluation protocols, and
   (v) Develop evaluation schedule.

b. On-Site Evaluation:
   (i) In-brief the Base Commander and the Officer Commanding the Base Support Wing,
   (ii) Collect information,
   (iii) Inspect the base,
   (iv) Meet with environmental agencies,
   (v) Provide regular feedback to the base environmental coordinator and the evaluated activities,

(vi) Identify actions to be taken to immediately initiate corrective actions for significant findings,

(vii) Record team member's findings on a daily basis,

(viii) Validate findings with responsible base individuals during the on-site evaluation,

(ix) Review findings with the base environmental coordinator, and

(x) Outbrief the Base Commander and the Officer Commanding the Base Support Wing.

c. Preparation of a draft environmental compliance audit report, including recommendations and identification of the appointment responsible for each action item.

d. Distribution of the draft audit report to the base for review and comments.

e. Preparation and distribution of the final environmental compliance audit report, with action items and responsible positions clearly identified.

f. Follow-up by base personnel, including scheduling, implementing, monitoring, and closing out all action items.

Written Audit Reports. The requirement for written audit reports should be detailed in the Facilities Manual.

A timetable for the preparation of the draft report, the review of the draft, and the preparation of the final environmental compliance audit report should also be given. The requirement for the report to contain sufficient documentation to demonstrate the thoroughness and appropriateness of the audit procedures should also be stressed.

The format and detail to be included in the audit report should also be set out in the Facilities Manual. This should include a requirement for the findings and recommendations to be summarised by protocol areas. In addition, the findings from all of the protocol areas should be ranked together in overall priority order as assessed by the review team. The requirement for the report to be as concise as possible should also be noted. A formal distribution plan for both the draft and the final audit reports should also be included in the Facilities Manual. The audited base should review the draft audit report for accuracy. Any relevant comments on the findings and recommendations, including verification of their validity, and comments on the nomination of the appointments responsible for action items should also be provided at this time. Small problems identified by the audit should be rectified, and larger deficiencies scheduled for remedial action before the final environmental compliance audit report is distributed. The Facilities Manual should note

the requirement for the audit report observations, findings, and recommendations to be as objective as possible, given the potential sensitivity of the information gathered.

Sections recommended for inclusion in the report are:

a. An executive summary.

b. An introduction, including the scope of the audit.

c. The audit findings.

d. Recommendations, including proposed actions and the responsible appointments.

e. Technical data, which will be included as appendices.

Clearly Identified Corrective Actions. The required corrective actions need to be clearly identified in the recommendations section of the audit report. Those appointments nominated in the report as being responsible for action items will be required to schedule, program for funding, implement, monitor, identify for formal closure, and evaluate the effectiveness of each of the remedial actions for which they are responsible. Recommendations for remedial actions need to be clearly stated in the audit report to allow such actions to be readily implemented. As previously noted, the audit findings will be ranked in priority order in the audit report, thereby allowing those appointments responsible for action items to assess the relative priorities of each of the actions for which they are responsible. Although a number of methods are available

for the assignment of priorities, ranking by the probability and potential severity of the hazard identified, and its possible effect on human health and the environment, is considered to be the most suitable criterion.

The requirement for a tracking system to monitor the progress of audit findings should be identified in the Facilities Manual. The status of all outstanding audit findings should be reviewed by the base Environmental Management Committee on at least a quarterly basis. All completed action items should be reported to and approved by the Committee, and should be noted in the minutes of the Committee's meetings. Quarterly status reports should also be provided to the relevant Command to allow for monitoring of the overall program. Where the resources required to rectify an audit finding are beyond the scope of base-level resources and/or delegations, appropriate programming bids are to be prepared by the base. In such cases, the findings of the audit report can be used to support the bid. Where the base implements other than the recommended course of action for correcting a deficiency, the reason for the selection of the alternative action should be documented. During subsequent audit reviews, the findings and recommendations from previous audits, and the status of their implementation, should be reviewed.

Quality Assurance Procedures. The use of audit appraisal questionnaires, to be completed by the base

Environmental Management Committee, is recommended as a means of quality assurance to check whether the audit review has been considered relevant and of assistance to the base's efforts to achieve the maximum possible environmental compliance and quality. Where experienced environmental audit consultants are contracted as members of the audit review team, they should be required to submit an appraisal of the overall effectiveness of the audit review, and to make recommendations regarding any possible improvements. Indeed, comments on the audit process should be sought from all members of the audit team at the conclusion of the review. As a measure of the overall success of the program, the number of noncompliances rectified as a consequence of the program should also be tracked.

The Proposed RAAF EAMP

The proposed RAAF EAMP, which has been developed from the above recommendations, is included as Appendix A to this report. Inclusion of the EAMP in the RAAF Facilities Manual (FACMAN), DI(AF) AAP 3300.001, is proposed. Accordingly, the proposed EAMP has been prepared in the format of the FACMAN. Section 12 of the FACMAN deals with environmental considerations. The proposed EAMP has therefore been developed as a draft chapter for inclusion in Section 12 of the RAAF Facilities Manual.

Included within the scope of the proposed EAMP are sections which provide an introduction to environmental compliance auditing, a description of the RAAF commitment to environmental compliance, and the RAAF environmental compliance objectives. Also included in the proposed EAMP are details of responsibilities, audit procedures, the requirements for audit reports, the procedures for following-up on corrective actions, the requirements for training, and quality assurance procedures.

In addition, annexes to the EAMP provide audit information source lists for each environmental protocol, an example of an auditor's checklist for each environmental protocol, and a suggested audit appraisal questionnaire. The audit information source lists include for each audit protocol a list of relevant legislation, physical features to inspect, and people to interview. The lists of relevant legislation have been drawn primarily from the document Draft Framework for Pollution Control (7), prepared for the RAAF by the Australian Construction Services. The lists of physical features to inspect have been drawn from a list prepared by DGF-AF/WMEE detailing those facilities on RAAF establishments which are known to have the potential to cause environmental concerns. The lists of people to interview have been developed taking into account responsibilities for the facilities listed as having the potential to cause environmental concerns. The example of

an auditor's checklist provided for each environmental protocol is intended as a guide only for the subsequent development of complete auditor checklists.

Implementation of the Proposed RAAF EAMP

As noted in Chapter III, there is a considerable degree of similarity between how the RAAF and the USAF conduct business. There is also a degree of similarity between the USAF ECAMP and the proposed RAAF EAMP. Therefore, examination of how the USAF has implemented ECAMP, and the resources required for the implementation and ongoing operation of ECAMP, have been used as a basis for determining the requirements for implementation of the proposed RAAF environmental audit management plan.

The implementation of the USAF ECAMP, in the areas of functional responsibility and management, development of policies and regulations, and procedures and guidelines for the conduct of audits, has been reviewed as a basis for identifying the RAAF requirements in these areas. In considering the RAAF requirements, other RAAF-specific factors, such as the RAAF organisational structure and RAAF requirements concerning the development of policy guidelines and procedures, have also been considered.

Based on the data collected on the level of resources required by the USAF to both initially implement and then operate the ECAMP, in terms of training, manpower and

financial requirements, estimates have been developed for the RAAF's requirements in these areas. This has been achieved by comparing the size of the USAF effort to that which would be required by the RAAF (in terms of number of bases, sizes of bases, and differences between the EAMP and the ECAMP), resulting in an estimate of the RAAF's training and manpower requirements. Based on these figures, and Australian cost data, an estimate of the financial resources required to implement the RAAF EAMP has been developed.

With the resource requirements identified in this manner, RAAF policies concerning manning, use of consultants, and financial appropriations and delegations have been examined to allow identification of a feasible proposal for the implementation of the EAMP.

Information on the resources required for the establishment and operation of ECAMP has been obtained from a variety of sources including HQ USAF, HQ Air Combat Command, AFIT School of Civil Engineering and Services, and an informal survey of base-level personnel. At HQ USAF, information was provided by the staff of the Civil Engineer directly involved with ECAMP, namely Capt John Ahern and Ms. Joeole Aiello. Information from Air Combat Command was provided by Ms. Cindy Holmes, and information from AFIT was obtained through numerous discussions with Capt Heidi Brothers, who has been extensively involved with ECAMP education and training. Information on the requirements of

ECAMP at the base level was obtained through an informal survey of base-level personnel attending an ECAMP training course. This survey gathered information from 28 base personnel representing 22 bases.

Establishment of the USAF ECAMP. Establishment of the USAF ECAMP was examined in terms of functional responsibilities and management, development of policies, development of the procedures and guidelines for conducting audits, development of training programs, and the establishment of funding sources.

Functional Responsibilities and Management. AFR 19-16 places the responsibility for the establishment and operation of environmental compliance assessment and management programs upon Environmental Protection Committees (EPCs) (19:3). The composition and responsibilities of the EPCs are detailed in AFR 19-8 Environmental Protection Committees and Environmental Reporting. AFR 19-16 notes that the Deputy Assistant Secretary of the Air Force (Environment, Safety and Occupational Health) is responsible for environmental compliance policy and oversight. This regulation also provides considerable detail concerning organisational responsibilities for ECAMP at the HQ USAF, major command, and installation levels. At HQ USAF, the Air Force Environmental Protection Committee and the Civil Engineer are each responsible for various aspects of ECAMP. At the major commands, the Environmental Protection

Committee, the Civil Engineering Directorate, the Bioenvironmental Engineering Office, and the Judge Advocate each have certain responsibilities for ECAMP. Other areas responsible for the budgeting and funding of corrective actions and for the provision of staffing assistance for audits also contribute to the successful implementation of ECAMP. At the installation level, those areas with responsibilities for ECAMP include the Environmental Protection Committee, the Base Civil Engineer, the Bioenvironmental Engineering Services, the Judge Advocate, Public Affairs, Safety Office, Operations, Base Supply, and other agencies as required for budgeting, funding, and staff assistance for audits.

Development of Policies. Policy guidelines for ECAMP are contained within AFR 19-16. This regulation includes details of the ECAMP objectives, implementation, definitions, organisational responsibilities, and the procedures for conducting environmental compliance audits. The regulation was prepared by the HQ USAF Director of Engineering and Services staff, using the USEPA Environmental Auditing Policy Statement (22:25004) of 1986 as the basis for the establishment of the ECAMP requirements. An initial draft policy letter was issued in 1986, followed by a policy letter in 1988 which required all installations to initiate the ECAMP process. AFR 19-16 was issued in 1990.

Development of Audit Procedures and Guidelines. ECAMP audit procedures and guidelines are contained within two documents. The first, as described above, is AFR 19-16. The second is the ECAMP Assessment Protocols Manual, consisting of 11 volumes. The first volume is an introduction, while the subsequent ten volumes each deal with one of the ten ECAMP environmental protocol areas. Each of the protocol volumes has a chapter which describes the regulatory guidelines applicable to that protocol, typically in a summarised format, and including relevant federal legislation, state and local requirements, and DOD and USAF regulations. Each of the protocol volumes also has a chapter which details the compliance requirements and responsibilities applicable to that protocol. In addition, key compliance definitions and detailed compliance checklists for use by auditors are included. The ECAMP Assessment Protocols Manual was initially developed by the Environmental Division of the US Army Construction Engineering Research Laboratory (USACERL), under contract to HQ USAF. The manual was then modified by HQ USAF staff to meet specific Air Force requirements. The manual is periodically updated, generally on an annual basis, by USACERL on a contract basis.

Development of Training Programs. ECAMP training courses were initially developed and conducted by the HQ USAF Director of Engineering and Services staff, with a

number of short courses conducted in 1988. Following this, two contracts were let with consultants who were each required to develop detailed training manuals and conduct a series of short one-week training courses over a two-year period (1989-90). During 1990, the AFIT School of Civil Engineering and Services also commenced running one-week ECAMP training courses. In 1991, AFIT took over sole responsibility for the conduct of ECAMP training and education courses (2). The AFIT ECAMP courses include a five day resident course which is currently offered five times per year, along with a number of on-site courses which are conducted in the field by AFIT instructors (11). AFIT has developed an ECAMP Training Manual which initially was based upon the training manuals prepared by the two consultants and which has subsequently undergone extensive modification by the AFIT staff (11). In addition to the ECAMP training course, AFIT also conducts a Commander's Environmental Leadership course for wing commanders and general officers. This course includes discussion on ECAMP and compliance, and is aimed at impressing upon commanders the importance of environmental issues and compliance in terms of liability and mission effectiveness. ECAMP overview lessons are also provided in five other AFIT courses, and ECAMP is briefly discussed in approximately 20 other AFIT courses (11), thereby providing some degree of

familiarity with ECAMP to a large number of personnel at all levels.

Establishment of Funding Sources. Prior to October 1990, funding for ECAMP activities was provided from existing Operations and Maintenance funding sources. However, since that time, separate sources of funding have been established for ECAMP and other compliance requirements. These separate sources of funding, which are only available for environmental compliance activities, have been established within a number of existing accounts, including the Operations and Maintenance, Military Construction, and Military Family Housing accounts. Currently, there are four categories of requirements which are funded from these sources. These categories are operations and service - environmental compliance, which includes training and the conduct of audits; rectification of items not currently in compliance; rectification of items which will be out of compliance in the future; and measures which go beyond compliance.

Recommendations for the Establishment of the RAAF EAMP. The following recommendations are made for the implementation of the RAAF EAMP, and have been included in the appropriate sections of the proposed EAMP at Appendix A.

Functional Responsibilities and Management. Overall coordination of environmental issues for the Australian Defence Force (ADF) is undertaken by the First

Assistant Secretary Facilities and Property (FASFP). A review of the proposed RAAF EAMP by the Environmental Section of FASFP is recommended to determine its suitability for introduction throughout the ADF.

At Air Force Office, DGF-AF/WMEE has responsibility for developing environmental policy and for overall coordination of environmental issues. As such, DGF-AF/WMEE would have functional responsibility for the EAMP. This would include responsibility for policy development and approval, program implementation, program coordination, monitoring the progress of the RAAF-wide program, monitoring noncompliance trends, assessing the effectiveness of the overall program, and the programming of funds as required to meet the RAAF's environmental compliance goals.

At the command level, the Command Facilities Officer would be responsible for monitoring the environmental compliance performance at each of the bases within the command, and for the programming and funding of those noncompliance rectification items which require resources beyond those available at the base level. The Command Facilities Officer would also be responsible for coordinating periodic external environmental compliance audits at each of the bases within the command.

Unit/Base Facilities Officers would be responsible to their Unit Commanders for the management of environmental compliance issues, including overall coordination and

monitoring of environmental compliance activities at the base. However, input and assistance from all units on the base will be required if the follow-up and rectification of findings is to be effective. For this reason, it is recommended that each unit should be required to appoint a unit environmental compliance officer (UECO), on a secondary duty basis, responsible for general compliance education and management and for coordinating, monitoring, and hastening rectification actions within their individual units. The establishment of an Environmental Management Committee (EMC) at each base, to manage the overall base environmental compliance program, including the monitoring and rectification of noncompliances, is also highly recommended. This committee should be chaired by either the Base Commander or the Officer Commanding the Base Support Wing to clearly demonstrate the level of the RAAF's commitment to environmental compliance. The committee should also include representation from all units on the base, preferably at the Officer Commanding and Commanding Officer levels.

Development of Policies. The proposed RAAF EAMP at Appendix A could be used as the starting point for the development and approval of the RAAF policy on environmental compliance auditing. Following completion and approval, the policy could initially be promulgated as an Air Force Temporary Instruction (Facilities), with subsequent publication as a chapter of the RAAF Facilities Manual

(FACMAN). Areas currently addressed in the proposed RAAF EAMP include an introduction to environmental compliance auditing, a description of the RAAF commitment to environmental compliance, the RAAF environmental compliance objectives, details of responsibilities, details of audit procedures, the requirements for audit reports, procedures for following up on corrective actions, the requirements for training, and quality assurance procedures.

Development of Audit Procedures and Guidelines. The proposed RAAF EAMP provides general guidelines for the procedures to be followed for the conduct of audits, preparation of reports and follow-up of findings. As an annex to the EAMP, examples of audit information source lists and auditor's checklists have been prepared. These examples provide guidance for the future development of comprehensive source lists and checklists, which would be required for each protocol area, thereby providing detailed guidance to audit team members. Summaries of the relevant portions of environmental legislative requirements, guidelines and codes, as they apply to each RAAF base, are included in the document Framework for Pollution Control, dated March 1990, which was prepared for the RAAF by the Australian Construction Services. This document provides the legislative basis for the development of the detailed source lists and checklists. The future development of comprehensive auditor checklists will need to be performed

as a contract service to DGF-AF/WMEE, as will the periodic updating of both the legislative basis and the auditor checklists..

Development of Training Programs. To allow for the effective conduct of internal and external audits by RAAF personnel, the introduction of a short (one week) environmental compliance auditing course is recommended. This course should be designed to provide potential audit team members with an understanding of environmental regulatory requirements, RAAF environmental policies, an introduction to environmental technologies, basic auditing methods and techniques for collecting information and interviewing base personnel, funding, and report writing. This course should be attended by base Facilities Officers, Unit Environmental Compliance Officers, and as many potential audit team members as possible. This formal training program would need to be developed and run by consultants with the necessary level of environmental expertise, as a contracted service.

In addition to this formal training for key personnel, training of personnel should also be achieved through the experience gained by the actual conduct of audits. To achieve this on-the-job training, audit teams should be selected to ensure a mixture of experienced and new team members. Initially, this will require a mixture of RAAF personnel and experienced auditing and environmental

consultants on the audit teams. However, as experience is gained by RAAF members, subsequent audit teams should then include a greater proportion of RAAF personnel, including a mixture of experienced and new RAAF team members. This would provide continuous training of personnel in the necessary skills required for effective auditing, and provide an adequate pool of experienced personnel from which to select audit team members.

In addition to the training of audit team members, it is also recommended that a broader education program, aimed at increasing the general level of awareness of all RAAF members concerning environmental issues and compliance, should also be introduced. This education program may need to consist of a number of elements, each targeting different levels of the Air Force, in order to provide effective communication of the importance of environmental issues and compliance to all RAAF members.

Establishment of Funding Sources. At least until such time as an environmental compliance program is fully implemented, funding of the various aspects of the EAMP should be obtained from existing sources. This would involve consultancy funds for hiring consultants to prepare the training course, to develop and periodically update detailed auditor checklists and other documentation as required, to periodically update the environmental legislative reference base, and to participate as team

members on audits; training funds for the conduct of the short training course; travel and accommodation funds for personnel attending training and participating in audit reviews; and most significantly, new works, repairs and maintenance, and supply funds for the rectification of noncompliances. When a compliance audit program has been fully implemented, and the annual financial requirements are better defined, it may be appropriate at that time to consider whether discrete funding should be established. If so, then a portion of the currently available funds could be set aside as funds available only for environmental compliance requirements, including the conduct of the environmental compliance audit program and the rectification of environmental noncompliances.

Resources Required for the USAF ECAMP. Estimates of the training, manpower, and financial resources which would be required by the RAAF to implement the EAMP have been based on the following data relating to the resource requirements of the USAF ECAMP.

Training Resources. As described above, all ECAMP training and education is now conducted by the AFIT School of Civil Engineering and Services. The ECAMP resident training course conducted by AFIT is of five days duration, and is currently offered five times per year, with a maximum number of 45 student places per offering. This results in a potential maximum training rate of 225 students per year.

In addition, AFIT instructors also periodically conduct ECAMP courses at other locations. These courses are generally of two to five days duration, with from two to eight training courses offered in the field per year.

AFIT currently has one instructor dedicated to ECAMP training, with a second instructor who is experienced with ECAMP available to assist as required. The ECAMP instructor is responsible for keeping the course current and for updates of the training manual. AFIT instructors provide the bulk of the instruction, with most instructors being either military personnel, or personnel from other government agencies. However, more recently, some outside consultants have also been used to lecture in the course (11). The cost of travel and accommodations for students attending the course is paid from the AFIT budget, as is the cost of all materials provided, including extensive ECAMP documentation. AFIT currently charges a fee of $800 US per week for non-defence personnel attending the course, with this figure based on full cost recovery (11). Applying this figure to 225 students per year, this represents an annual training expense of $180,000 US, excluding travel and accommodation expenses.

Manpower Resources. HQ USAF Civil Engineering currently has two people who are dedicated to ECAMP activities. In addition, the Headquarters Air Force Environmental Protection Committee meets on a quarterly

basis, and considers ECAMP policy and issues as a part of its agenda. This committee is co-chaired by the Deputy Assistant Secretary of the Air Force (Environment, Safety and Occupational Health) and the Vice Chief of Staff of the Air Force. The committee consists of approximately 20 members, predominantly of general officer rank.

The AFIT School of Civil Engineering and Services currently has one instructor dedicated to ECAMP training and education. A second instructor who is also experienced with ECAMP is also available to assist as required.

As an example of staffing at the MAJCOM level, Air Combat Command has a staff of five dedicated to ECAMP activities. Each of the MAJCOMs also has an EPC which meets on a quarterly basis. Air Combat Command staff indicated that for their bases, there would typically be one person dedicated to ECAMP at the larger bases, with one or two people managing ECAMP as an extra duty at the smaller bases (26). From the survey of base personnel, the number of audit team members participating in the last audit at those bases ranged from six to 25, with an average of 15 audit team members for both internal and external audits. The time taken for each audit review ranged from three to ten working days, with an average duration of about seven working days.

Financial Resources. The number of noncompliances identified through the ECAMP process in 1990 and 1991 across

the entire Air Force was of the order of 3,000 annually (3). Of these noncompliances, approximately 80 percent were assessed as being quick and easy to rectify. However, the balance of the noncompliance problems required considerable effort and expenditure. The USAF is currently fully funding all ECAMP training requirements, all auditing requirements, and the rectification of all current and anticipated noncompliances. The cost of USAF compliance activities, as reflected in the USAF budget for the 1992 fiscal year for compliance activities world-wide, is approximately $500M US (2). This figure includes all compliance activities, irrespective of whether they are identified through ECAMP or through some other process.

As discussed above, the cost of AFIT ECAMP training has been estimated to be approximately $180,000 US per year, excluding travel and accommodation costs. As an indication of the cost for contractor preparation of the ECAMP Assessment Protocols Manual, manuals for USAF bases in the United Kingdom and in Germany have recently been prepared at costs of $80,000 US and $50,000 US respectively (2). The cost for the most recent annual update of the ECAMP Assessment Protocols Manual, performed under contract with HQ USAF, was $30,000 US (2). The average cost of conducting external audits in Air Combat Command has been estimated to be approximately $50,000 US per visit (26). This figure represents the costs for travel, accommodations, and hiring

of consultants as audit team members. Air Combat Command is responsible for 35 bases. With external audits held at each base on a three-year cycle, this results in about 12 external audits per year.

Estimate of the Resources Required for the EAMP. Based upon the above discussion of the resources required for ECAMP, the following initial estimates of the resource requirements for the proposed RAAF EAMP are provided.

Training Resources. The proposed short training course for personnel involved with environmental compliance auditing activities should be administered by DGF-AF/WMEE. However, as already discussed, the development and administration of the training course would need to be performed by a consultant under contract with the RAAF and working in close liaison with WMEE. Two courses per year, with up to 20 students per course, is considered sufficient to provide training for key personnel and to also provide an adequate pool of trained personnel for selection as audit team members. The Gas and Fuel Corporation of Victoria currently conducts an Energy Management course of five days duration which has been established to meet the specific requirements of the RAAF. This course, which has a maximum number of 16 student places, is currently conducted for the RAAF once per year at a charge of 7,500 AUD. Based upon this, the cost for a contractor to run two environmental compliance courses per year, each of five days duration and

each with up to 20 student places, is estimated to be 20,000 AUD. Student travel and accommodation expenses would be in addition to this amount.

Manpower Resources. Within DGF-AF/WMEE, one position dedicated to environmental compliance, including environmental compliance auditing, would be required to meet the program management responsibilities. Similarly, at both Air Headquarters and Logistics Command, one dedicated position within the Command Facilities organisation would also be required. In the case of Training Command, the environmental compliance responsibilities could probably be handled as a partial duty. At the six largest bases, Amberley, Edinburgh, Richmond, Pearce, Williams, and Williamtown, the establishment of a position within the Facilities Sections dedicated to environmental compliance is also recommended. However, at the remaining 15 bases and depots, these responsibilities could be handled as a partial duty. As previously discussed, the appointment of unit environmental compliance officers at each base-level unit, and the establishment of an Environmental Management Committee at each base, is also recommended.

Internal audits will be conducted annually using base personnel. However, the hiring of some consultants to participate in these reviews may be appropriate in situations where the RAAF does not have the appropriate level of in-house expertise to examine certain processes and

facilities. External audits organised by the applicable Command are recommended to be conducted on a three year basis for the six larger bases, and on a five year basis for the remaining 15 bases and depots. This will result in a RAAF-wide requirement for five external audits per year, with two occurring at larger bases and three occurring at smaller bases. Allowing a maximum of ten members per audit team, and an average audit duration of five working days, will result in the equivalent total of one man-year of effort for the conduct of the audits, shared amongst RAAF and contractor personnel.

Financial Resources. The USAF budget for compliance activities in the 1992 fiscal year is approximately $500M US, which represents about 0.6 percent of the total USAF budget of approximately $90B US for the 1992 fiscal year. Applying this same percentage (0.6%) to the 1991/92 RAAF budget of 1,600M AUD would represent an amount of 10M AUD. However, given that the development and enactment of environmental legislation is currently more advanced in the United States than presently in Australia, that the RAAF has never handled many of the dangerous materials used by the USAF, and that a new RAAF compliance program would be in its infancy, initial annual costs would be expected to be considerably less than this amount.

Proposed Schedule for Implementing the EAMP. The following proposed schedule is intended as a guide for

possible implementation of the RAAF Environmental Audit Management Plan:

a. Year One:

- Obtain approval and commitment of senior RAAF management for the introduction of a RAAF environmental compliance audit program.
- Establishment of a position within DGF-AF/WMEE dedicated to environmental compliance management.
- Further development, review, approval and publication of the Environmental Audit Management Plan as a chapter of the RAAF Facilities Manual.
- Update by consultants of the environmental legislative basis applicable to RAAF establishments (estimated cost = 20,000 AUD).

b. Year Two:

- Preparation by consultants of detailed auditor checklists (estimated cost = 30,000 AUD).
- Preparation by consultants of training course and training manual (estimated cost = 20,000 AUD).
- Establishment of a position within each of Air Headquarters and Logistics Command

dedicated to environmental compliance management.

c. Year Three:

- Conduct of first environmental compliance audit training course. Two courses per year to be run by consultants (estimated annual cost = 20,000 AUD).
- Establishment of a position dedicated to environmental compliance within the Facilities Sections at the larger bases.
- Establishment of an Environmental Management Committee at each base.
- Commencement of environmental compliance audits. Five external audits to be conducted each year (estimated annual cost = 75,000 AUD).
- Commence two yearly update of the environmental legislative basis applicable to RAAF establishments (estimated cost = 10,000 AUD), the detailed auditor checklists (estimated cost = 10,000 AUD), and the training course and training manual (estimated cost = 5,000 AUD).

Summary

The structure of the RAAF EAMP was developed by combining the essential characteristics required for an effective environmental auditing program, as identified in Chapter II, with the USEPA design guidelines for audit programs for government agencies. Information on Australian environmental legislation, DOD/RAAF policies and regulations, and details of the RAAF Base Tindal Environmental Management Plan were placed within this framework to produce the EAMP. The USAF Environmental Compliance Assessment and Management Program was also used as a practical example of an existing audit management plan to provide further guidance in the production of the RAAF EAMP.

Based upon an analysis of the above information, a series of recommendations were made concerning the specific items considered appropriate for inclusion in the RAAF EAMP. The proposed RAAF EAMP was based on these recommendations and is included at Appendix A.

To determine what would be required to implement the proposed EAMP, data on the implementation and operation of ECAMP was collected and analysed. Based on this information, estimates of the resource requirements associated with implementation of the EAMP were prepared.

# V. Conclusions and Recommendations

## Chapter Overview

This chapter summarises the main points of the preceding chapters of this research, and provides comments on the significance of the findings. The practical implications of the results for the RAAF are also discussed. Finally, recommendations are provided concerning further research which would be required to develop a comprehensive Environmental Management Plan for the RAAF.

## Summary

The purpose of this research was to develop an Environmental Audit Management Plan tailored to meet the specific requirements of the RAAF. In addition, the research also examined the resources which would be required to introduce the proposed EAMP into the RAAF. The adoption of such a management plan should provide the RAAF with a systematic and effective organisation-wide management tool for improving environmental performance at all RAAF facilities. In particular, the ability of the RAAF to achieve and maintain compliance with all applicable environmental laws and regulations should be significantly enhanced.

Given the growing importance and emphasis now being placed upon environmental matters in Australia, a proactive approach by the RAAF to environmental matters is considered

to be essential. By introducing management programs which will enable the RAAF to more effectively meet its environmental obligations, the RAAF will be better positioned to achieve its mission of conducting effective strategic and tactical air operations in the pursuit of Australia's defence and national interests.

Environmental compliance auditing can be described as a management tool which an organisation uses to carry out a structured and systematic evaluation of its environmental performance. There are many potential benefits for organisations which conduct environmental compliance audits. These can include improved working relationships with regulatory authorities; reduced financial liabilities; identification of more efficient operating procedures; avoidance of civil and criminal penalties; early identification of problems; and increased environmental awareness.

The literature on environmental compliance auditing identifies a number of essential characteristics required for an effective environmental auditing program. These include top management support; commitment to follow up on findings; independent auditors; adequate staffing and training of auditors; establishment of clear and specific program objectives; clearly defined procedures; written audit reports; clearly identified corrective actions; and quality assurance procedures.

Proper attention to these aspects of environmental compliance auditing is considered to be essential in the development of an effective audit management plan. Accordingly, these elements have been used as the basis for the development of the RAAF EAMP.

The essential elements of an effective environmental compliance audit management plan, as identified in the literature review, combined with the USEPA design guidelines for the development of audit programs for government agencies, were used to develop the structure of the RAAF EAMP. To ensure the development of an audit management plan which would meet the specific requirements of the RAAF, details of the RAAF requirements were obtained through the collection and analysis of data from Australia. This included Australian environmental legislation, DOD/RAAF policies and regulations, and details of the RAAF Base Tindal Environmental Management Plan. The RAAF EAMP was then prepared by placing these RAAF-specific requirements within the structure developed for this purpose. The USAF ECAMP was also used as a practical example of an existing audit management plan to provide further guidance in the production of the RAAF EAMP. From this process, a series of recommendations were made concerning the specific items considered appropriate for inclusion in the RAAF EAMP. The proposed RAAF EAMP, which is included as Appendix A to this report, was prepared based upon these recommendations.

To determine what would be required to implement the proposed EAMP, data on the implementation and operation of ECAMP was collected and analysed in the areas of management of the program, training, manpower, and financial resources. This information was used to develop estimates of the RAAF resource requirements associated with implementation of the EAMP, taking into account scale differences between the RAAF and the USAF.

## Conclusions

The result of this research effort has been the preparation of an Environmental Audit Management Plan (EAMP) which meets the needs of the RAAF. This EAMP is included at Appendix A to this report. The ability of the RAAF to implement this management plan utilising existing resources has also been discussed.

Significance of the Study. This report is considered to provide a sound basis for the adoption of an environmental compliance audit management program by the RAAF. The report provides considerable background information on environmental compliance auditing, along with details of the benefits offered by an effective audit program. This information could be used to form the basis of a submission to the RAAF senior management, seeking approval and support for the introduction of an environmental compliance auditing program.

The proposed RAAF EAMP has been based on an extensive survey of the current literature on environmental compliance auditing, and also reflects the recommendations of the USEPA and the experience of the USAF with their environmental compliance program. Given the level of expertise which has been drawn upon, the proposed RAAF EAMP is considered to be sound. Although the proposed EAMP would need to be reviewed by a number of functional areas within the RAAF, with inevitable changes and amendments, it does provide a good starting point for the introduction of a RAAF environmental compliance audit management program. In particular, it provides a catalyst for this process to begin, and therefore should be of considerable benefit for the introduction of such a program by the RAAF. The introduction of this type of program should result in improved environmental performance, thereby enhancing the RAAF's ability to continue to effectively meet its primary mission.

Implications of the Study. This study has resulted in the preparation of a very practical product which can be used as the starting point for the introduction of an environmental compliance audit management program in the RAAF. Beyond that, it is hoped that this study will also provide the stimulus, and potentially the guidance, for the development of further environmental management plans, each designed to meet the specific requirements of the RAAF in one of the environmental protocol areas. These protocol

areas include air emissions management, water quality management, solid waste management, hazardous materials management, hazardous waste management, natural and cultural resources and social issues management, buffer zone management, and environmental contingency management.

The ultimate goal of the preparation of these individual environmental management plans would be to produce a comprehensive environmental management plan for the RAAF, encompassing all of the individual plans. This comprehensive environmental management plan could then be used as the basis for developing individual comprehensive environmental plans for each of the RAAF's bases and facilities.

Recommendations for Further Research

As discussed above, the ultimate goal of the RAAF, in terms of environmental management, should be the introduction of RAAF-wide management programs which address its requirements in each of the environmental protocol areas. The process used to develop the EAMP could be used as a guide for the subsequent development of each of these individual environmental management plans. Eventually, it is envisaged that this would result in the development of a comprehensive environmental management plan for the RAAF.

## Appendix A: Proposed RAAF EAMP

## RAAF ENVIRONMENTAL AUDIT MANAGEMENT PLAN

### Introduction

101. There is currently a large and ever-increasing volume of environmental legislation and regulations which have been enacted at the Commonwealth, State and Territory, and local government levels. Many of these environmental laws and regulations impact directly upon the facilities and operations of the Royal Australian Air Force. To ensure that these requirements do not adversely affect the RAAF's ability to perform its mission, it is necessary to maximise the RAAF's compliance with all environmental legislation.

102. The requirement for compliance with all applicable environmental laws and regulations, enacted at all levels of government, is an extremely complex issue given the volume and diversity of the laws and regulations involved. To provide a systematic and effective RAAF-wide management tool to meet this challenge, a RAAF environmental audit management plan (EAMP) has been introduced.

103. The purpose of the RAAF EAMP is to achieve and maintain maximum possible compliance with all applicable environmental laws and regulations, at all RAAF facilities.

104. Definition of Environmental Compliance Auditing. Environmental compliance auditing is defined as a systematic, documented, periodic, and objective review of facility operations and practices related to meeting environmental requirements.

105. In practice, an environmental compliance audit involves a systematic review of physical facilities, documents, and operations, coupled with personal interviews to help determine the compliance (regulatory or policy), risk status (danger of episodes to the community, the environment or the employees), and management practice status of the facility being audited. An environmental compliance audit assesses whether an organisation or facility is in compliance with all applicable environmental laws and regulations.

106. Given the growing importance and emphasis now being placed upon environmental matters in Australia, proper attention by the RAAF to the environment, and to environmental compliance, is increasingly seen as being an essential requirement for the RAAF. By meeting its environmental obligations, the RAAF will be better positioned to achieve its mission of conducting effective strategic and tactical air operations in the pursuit of Australia's defence and national interests.

107. Benefits of Environmental Compliance Auditing. There are a number of benefits associated with an effective

environmental compliance auditing program. These include the potential for improved relationships with regulatory authorities, avoidance of potential problems which could adversely affect operations, identification and introduction of more efficient operating procedures, early identification of environmental problems, and increased environmental awareness.

108. The rate at which new environmental legislation has been introduced in recent years is not expected to decline in the foreseeable future. The implementation of the RAAF EAMP will place the RAAF in a position where it is better able to meet the ongoing requirement for compliance with all existing and new environmental legislation.

RAAF Commitment to Environmental Compliance

109. The RAAF is fully committed to achieving the maximum possible level of environmental compliance. Indeed, the RAAF recognises the importance of environmental compliance as a necessary part of doing business if the RAAF is to fully meet its national obligation of conducting effective air operations in the pursuit of Australia's defence and national interests. The EAMP is seen as being a management tool which is intended to assist individual bases to better meet their operational and environmental objectives. The importance of proper attention and regard

to environmental matters today, to allow the RAAF to continue to effectively meet its mission in the future, can not be over emphasised. The RAAF commitment to environmental compliance includes not only the identification of noncompliances, but extends to a commitment to rectify any identified problems as soon as is practical.

RAAF Environmental Compliance Objectives

110. The objectives of the RAAF EAMP are aimed at enhancing the RAAF's ability to meet its mission by ensuring that environmental compliance is properly managed. The specific objectives of the RAAF EAMP are to:

a. Verify the RAAF's compliance with all applicable environmental laws and regulations.

b. Improve the RAAF's environmental compliance performance.

c. Provide sound environmental management to ensure no adverse impact upon the RAAF's mission effectiveness.

d. Increase environmental awareness within the RAAF.

e. Identify more effective ways of achieving environmental compliance.

f. Identify actions required to improve the RAAF's environmental performance and make provision for their implementation.

g. Identify opportunities for increased efficiency and cost savings which would result from the implementation of pollution prevention practices.

h. Anticipate future environmental issues that may affect the RAAF, thereby reducing or eliminating potential adverse impacts upon the RAAF's mission effectiveness.

Responsibilities

111. Overall coordination of environmental issues for the Australian Defence Force (ADF) is undertaken by the First Assistant Secretary Facilities and Property (FASFP). At Air Force Office, DGF-AF/WMEE has responsibility for developing environmental policy and for overall coordination of environmental issues. As such, DGF-AF/WMEE has responsibility for the EAMP with regard to policy development, program coordination, monitoring the progress of the RAAF-wide program, monitoring noncompliance trends, assessing the effectiveness of the overall program, and the programming of funds as required to meet the RAAF's environmental compliance goals.

112. The Command Facilities Officers are responsible for monitoring the environmental compliance performance at each of the bases within their Command, and for the programming and funding of those noncompliance rectification items which require resources beyond those available at the base level. Commands are also responsible for coordinating periodic external environmental compliance audits at each of the bases within their Command.

113. Unit/Base Facilities Officers are responsible to their Unit Commanders for the management of environmental compliance issues, including overall coordination and monitoring of environmental compliance activities at the base level. However, input and assistance from all units on the base will be required if the follow-up and rectification of findings is to be effective. For this reason, each unit is required to appoint a unit environmental compliance officer (UECO), on a secondary duty basis, responsible for general compliance education and management and for coordinating, monitoring, and hastening rectification actions within their individual units. The establishment of an Environmental Management Committee (EMC) at each base, to manage the overall base environmental compliance program, including the monitoring and rectification of noncompliances and other environmental problems or issues, is also required. This committee is to be chaired by either the Base Commander or the Officer Commanding the Base Support

Wing. The committee is also to include representation from all units on the base, preferably at the Officer Commanding and Commanding Officer levels. The EMC is responsible for monitoring all open findings on at least a quarterly basis, with all completed findings to be reported to and approved by the committee for final closure. The closure of each finding is to be documented in the minutes of the committee. During subsequent audits, progress made towards rectifying previously-identified noncompliances are to be assessed.

114. Despite the individual responsibilities set out in this policy, it should be emphasised that environmental compliance is the responsibility of all members of the RAAF, and full compliance can only be achieved through the commitment and cooperation of all members working together to achieve this goal.

Audit Procedures

115. Environmental compliance audits are to be carried out for each base on an annual basis. This is to be achieved using a combination of internal and external audits. Internal audits are the responsibility of the base, and will be conducted by base personnel. External audits will be the responsibility of the relevant Command, with the audit team drawn from personnel external to the particular base being audited. An external audit of each facility is

to be conducted on a three to five yearly basis, depending upon the size of the base. The external audits are to be supplemented by internal audits of each facility, to be conducted on an annual basis in those years for which an external audit is not scheduled.

116. Internal Audits. A complete internal audit of all of a base's facilities and operations is to be conducted on an annual basis using personnel available on the base, supplemented with consultants as required for any activities for which particular expertise is not available at the base level. This annual internal audit is to be overseen by the base Environmental Management Committee, with the base Facilities Officer and the Unit Environmental Compliance Officers responsible for implementation.

117. Internal Auditors. Internal environmental audit team members should be drawn from as wide a cross-section of base activities as possible to ensure a wide range of expertise and experience. The inclusion of personnel associated with each of the types of facilities or activities to be audited offers many advantages, including greater credibility, increased awareness of regulatory and RAAF requirements, and very importantly, demonstrates that environmental programs are the responsibility of all personnel.

118. External Audits. In addition to the annual internal audits, less frequent external audits using

completely independent auditors, are also required. At larger bases, such as Amberley, Richmond and Williamtown, these external audits will initially be conducted at three yearly intervals. For smaller bases, such as East Sale, Pearce and Townsville, these external audits will initially be conducted at five yearly intervals. The frequency of external audits will be periodically reviewed by DGF-AF/WMEE based upon the outcome of the audit findings over time. External audits of bases are to be coordinated and organised by the relevant Command.

119. External auditors. External audit team members can be drawn from the Command, Air Force Office, other bases, DOD, other Government agencies, and consultants. In most cases, it is suggested that personnel from most, if not all, of the above categories be used to form an external audit team. In this way, the expertise which exists at all levels of the RAAF can be utilised, supplemented by outside specialists in those areas in which the RAAF does not have the necessary expertise. The use of some auditors from outside of the RAAF also provides the advantage of bringing in new knowledge which can be assimilated by the RAAF. External auditors also offer the advantage of being able to take a fresh look at RAAF procedures and operations, without the constraint of preconceived ideas. The use of personnel from other bases encourages the cross-flow of information and ideas between bases, and furthers the goal of enhancing

environmental knowledge amongst RAAF personnel. When putting together an audit team, the requirement to select personnel who are in a position to conduct objective and unconstrained inquiry and observation also needs to be considered.

120. Audit Team Size and Duration of Audits. The size of a particular audit team, and the time period required to conduct an effective audit, will depend upon the size, operations, facilities, and complexities of each individual base. Although these requirements will best be judged over time with actual experience, a reasonable initial estimate of the requirements, for both internal and external audits, is considered to be five to ten team members, for five to ten working days. However, this will vary from base to base, depending upon the various factors relevant to the particular base.

121. Audit Procedures. Environmental compliance audit procedures, including audit protocols and summaries of the relevant portions of legislative requirements, guidelines and codes have been developed. These should benefit both facility operators and compliance auditors, enabling them to more efficiently and effectively achieve their environmental compliance goals.

122. Audit Protocols. The audit protocols are checklists designed to provide guidance to audit team members when conducting audits. In particular, the

protocols include advice on who to talk to, what to look for, and the appropriate questions to ask to identify any environmental problems or deficiencies. Audit protocols have been developed in each of the following environmental categories:

a. Air emissions management,

b. Water quality management (including drinking water and waste water discharge),

c. Solid waste management,

d. Hazardous materials management,

e. Hazardous waste management,

f. Natural and cultural resources and social issues management,

g. Buffer zone management (including noise, airfield design criteria, and explosive ordnance requirements), and

h. Environmental contingency management.

Audit information source lists and auditor checklists have been produced for each of the protocol areas, and these are included at Annexes A and B respectively.

123. Legislative Requirements. Summaries of the relevant portions of environmental legislative requirements, guidelines and codes, as they apply to each RAAF base, are included in the document Framework for Pollution Control, dated March 1990, which was prepared for the RAAF by the Australian Construction Services.

124. Steps of an Audit Review. The following sequence of steps are to be followed for the conduct of external environmental compliance audit reviews:

a. Pre-Evaluation Activities:

(i) Define evaluation scope,

(ii) Select team and allocate responsibilities,

(iii) Review relevant regulations,

(iv) Review evaluation protocols, and

(v) Develop evaluation schedule.

b. On-Site Evaluation:

(i) In-brief the Base Commander and the Officer Commanding the Base Support Wing,

(ii) Collect information,

(iii) Inspect the base,

(iv) Meet with environmental agencies,

(v) Provide regular feedback to the base environmental coordinator and the evaluated activities,

(vi) Identify actions to be taken to immediately initiate corrective actions for any significant findings,

(vii) Record team member's findings on a daily basis,

(viii) Validate findings with responsible base individuals during the on-site evaluation,

(ix) Review findings with the base environmental coordinator, and

(x) Outbrief the Base Commander and the Officer Commanding the Base Support Wing.

c. Preparation of a draft environmental compliance audit report, including recommendations and identification of the appointment responsible for each action item.

d. Distribution of the draft audit report to the base for review and comments.

e. Preparation and distribution of the final environmental compliance audit report, with action items and responsible positions clearly identified.

f. Follow-up by base personnel, including scheduling, implementing, monitoring, and closing out all action items.

The steps to be followed for the conduct of internal audit reviews are the same, except all activities will be conducted by base personnel.

Audit Reports

125. Written Audit Reports. Written audit reports are to be prepared by the audit review team following both internal and external audit reviews. The report should contain sufficient documentation to demonstrate the thoroughness and appropriateness of the audit procedures followed during the review, but should also be kept as concise as possible. The requirement to keep the audit report observations, findings, and recommendations as objective as possible should always be considered, given the potential sensitivity of the information being gathered.

126. At the completion of the review, the findings and recommendations are to be summarised by protocol areas. In addition, the findings from all of the protocol areas should be ranked together in overall priority order as assessed by the review team.

127. The following sections should be included in the report:

a. An executive summary, which is to include the summary of findings by protocol and the ranking of findings.

b. An introduction, including the scope of the audit.

c. Details of the facilities, operations and procedures inspected, and the resultant audit findings listed by protocol.

d. Recommendations, including proposed actions and the nominated appointment responsible for each action item.

e. Technical data relating to the findings and recommendations, which will be included as appendices.

128. Clearly Identified Corrective Actions. The required corrective actions are to be clearly identified in the recommendations section of the audit report. Those appointments nominated in the report as being responsible for action items will be required to schedule, program for funding, implement, monitor, close out, and evaluate the effectiveness of each of the remedial actions for which they are responsible. Recommendations for remedial actions are to be clearly stated in the audit report to allow such actions to be readily implemented. The audit findings will be ranked in priority order in the audit report, thereby providing guidance to those appointments responsible for action items to assess the relative priorities of each of the actions for which they are responsible.

129. Although a number of methods are available to the audit review team for the assignment of priorities, ranking by the probability and potential severity of the hazard

identified, and its possible effect on human health and the environment, is considered to be the most suitable criterion.

130. Timetable for the Preparation of Audit Reports. For both internal and external audits, a draft report is to be prepared by the audit team within ten working days of completion of the audit review.

131. Internal Audits. In the case of internal reviews, the draft report should be presented and briefed to the Environmental Management Committee, which is responsible for review and endorsement of the report. When accepted by the Environmental Management Committee, this report becomes the final environmental compliance audit report. Copies of the final report are to be forwarded to the relevant Command Facilities Officer and DGF-AF/WMEE within two months of the completion of the audit review.

132. External Audits. In the case of external audits, the draft report is to be forwarded to the base for review and comment within ten working days of completion of the audit. Where possible, completion of the draft report before the review team leaves the base is desirable. In either case, the review team leader is required to brief the Commander and the Officer Commanding the Base Support Wing of the findings and recommendations of the review team. The base should check the draft audit report for accuracy, and is required to provide all relevant comments to the review

team leader within two months of receipt of the draft report. Acceptance or rejection of each of the findings should be provided by the base. Where a finding is rejected, the reasons are to be clearly indicated. Alternative remedial actions to those recommended by the audit team may also be proposed by the base. Any other comments on the recommendations and the nomination of the appointments responsible for action items should also be provided at this time. Upon receipt of the base comments, the review team is required to make any necessary amendments and corrections, and to then prepare the final environmental compliance audit report. The final report is to be distributed to the base, the Command Facilities Officer (CFACO), and DGF-AF/WMEE within one month of receipt by the review team leader of the base comments on the draft report.

133. In the case of both internal and external reviews, small problems identified by the audit should be rectified, and larger deficiencies scheduled for remedial action, before the final environmental compliance audit report is distributed.

Follow-up on Corrective Actions

134. The base Environmental Management Committee (EMC) is responsible for tracking the progress of all

noncompliances identified at its base. While the EMC is responsible for overall monitoring and progress, input and assistance from all units on the base will be required if the follow-up and rectification of findings is to be effective. For this reason, Unit Environmental Compliance Officers are responsible for coordinating, monitoring, and hastening rectification actions within their individual units. The appointments nominated in the audit report recommendations as being responsible for remedial action items will be required to review, schedule, program for funding, implement, monitor, close out, and evaluate the effectiveness of each of the individual remedial actions for which they are responsible.

135. The EMC is responsible for monitoring all open findings, and the status of all outstanding findings should be reviewed by the committee on at least a quarterly basis. All completed findings are to be reported to the committee for acceptance of their closure, which is to be documented in the minutes of the committee. Quarterly status reports are to be provided to the relevant Command to allow monitoring of the overall program. Where the resources required to rectify an audit finding are beyond the scope of base-level resources and/or delegations, appropriate programming bids are to be prepared by the base and forwarded to the Command. In such cases, the findings of the audit report can be used to support the bid. Where the

base implements other than the recommended course of action for remediating a deficiency, the reason for the selection of the alternative action should be documented. During subsequent audit reviews, the recommendations from previous audits, and the status of their implementation, should be reviewed.

136. At the Command level, the Command Facilities Officer is responsible for monitoring the performance at each of the bases within the Command. The CFACO is also responsible for the programming and funding of those rectification items which require resources beyond those available at the base level.

137. At Air Force Office, DGF-AF/WMEE is responsible for monitoring the progress of the RAAF-wide program, and for the programming of adequate funds to meet the RAAF's environmental compliance goals.

Training

138. To allow for the effective conduct of internal and external audits by RAAF personnel, a short (one week) environmental compliance auditing course has been introduced by the RAAF. This course is aimed at providing potential audit team members with an understanding of environmental regulatory requirements, RAAF environmental policies, an introduction to environmental control technologies, and

basic auditing methods and techniques for collecting information and interviewing base personnel. This course should be attended by base Facilities Officers, Unit Environmental Compliance Officers, and other interested personnel with the potential to be audit team members.

139. In addition to this short training course for key personnel, most of the training of personnel will be achieved through actual experience in conducting audits. To achieve this on-the-job training, audit teams are to be selected to ensure a mixture of experienced and new team members. At least initially, this will require a mixture of RAAF personnel and experienced auditing and environmental consultants on the audit teams. As experience is gained by RAAF members, subsequent audit teams can then include a greater proportion of RAAF personnel, including a mixture of experienced and new RAAF team members. This should provide continuous training of personnel in the necessary skills required for effective auditing, and provide an adequate pool of experienced personnel from which to select audit team members.

Quality Assurance

140. At the conclusion of each audit review, following the distribution of the final environmental compliance audit report, an audit appraisal questionnaire is to be completed

by the base Environmental Management Committee. A copy of the appraisal questionnaire is included at Annex C. The purpose of this questionnaire is to assess whether the audit review has been considered relevant and of assistance to the base's efforts to maximise environmental compliance and quality. Copies of the completed audit appraisal questionnaire are to forwarded to the audit team leader, the Command Facilities Officer, and DGF-AF/WMEE.

141. When consultants are contracted as members of the audit review team, they are required to submit a brief appraisal report of the overall effectiveness of the audit review, and make recommendations regarding any possible improvements. This report will be provided to the audit team leader at the conclusion of the review. The audit team leader should also seek comments on the audit process from all members of the audit team. Any recommendations which the audit team leader believes should be incorporated into the auditing process are to be forwarded to the Command Facilities Officer and DGF-AF/WMEE.

142. As a measure of the overall success of the program, the number of noncompliances identified and rectified as a consequence of the program will be tracked by DGF-AF/WMEE.

Annexes:

A. Audit Information Source Lists.

B. Auditor's Checklists.

C. Audit Appraisal Questionnaire.

ANNEX A TO
THE PROPOSED
RAAF EAMP

## AUDIT INFORMATION SOURCE LISTS

This annex provides audit information source lists for each of the eight audit protocols. Included for each protocol are source lists identifying relevant environmental legislation, physical features to inspect, and people to interview. The information source lists are designed to provide guidance to audit team members for both the preparation and conduct of audits. Audit information source lists have been developed for each of the following environmental protocols:

I. Air emissions management,

II. Water quality management (including drinking water and waste water discharge),

III. Solid waste management,

IV. Hazardous materials management,

V. Hazardous waste management,

VI. Natural and cultural resources and social issues management,

VII. Buffer zone management (including noise, airfield design criteria, and explosive ordnance requirements), and

VIII. Environmental contingency management.

## I. Air Emissions Management

### Legislative Basis:

1. Australian Environment Council, Strategy for Ozone Protection, 1989.
2. Air Quality Goals Recommended by the National Health and Medical Research Council - Recommended Methods of Monitoring Air Pollutants in the Environment 1985.
3. New South Wales - Clean Air Act 1961 and Clean Air Regulations 1964 and 1988.
4. Victoria - State Environment Protection Act 1970 and Amendments Act 1988.
5. Victoria - State Environment Protection Policy - The Air Environment 1981.
6. Queensland - Clean Air Act 1963-1988 and the Clean Air Regulations 1983.
7. Queensland - Hazardous Substances (CFCs and other Ozone Layer Depleting Substances) Regulations 1988.
8. South Australia - Clean Air Act 1984, the Clean Air Act Amendment Acts 1986 and 1989, and the Regulations under the Clean Air Act.
9. Western Australia - Environmental Protection Act 1986.
10. Australian Capital Territory - ACT Air Pollution Ordinance 1984 and Regulations 1984 and 1986.

Physical Features to Inspect:

1. Painting and Stripping Activities - solvent fumes and isocynates.
2. Battery Maintenance Areas - acid and alkali fumes from sulphuric acid and potassium hydroxide.
3. Motor Transport Maintenance Facilities - exhaust gases.
4. Technical Maintenance Facilities - solvent fumes and CFC cleaners including freon.
5. Engineering Maintenance Facilities - abrasive blasting grit, fibreglass dust and welding fumes.
6. Safety Equipment (Life Support) Sections - isocynate fumes from glues.
7. Facilities Flight - wood dust and paint shop.
8. Incinerators - particulates and other air pollution.
9. Photographic Facilities - chemical fumes.
10. Fire Training Activities - particulates and other air pollution.
11. Construction and Demolition Activities - dust.
12. Grounds and Gardens Maintenance - air pollution from burnoffs.
13. Electroplating - numerous fumes, and metallic dust from polishing.
14. Electronics Maintenance Facilities - numerous fumes from printed circuit board maintenance.
15. Base Calibration Centres - solvent fumes.

16. Sewerage Treatment Systems - hazardous gases.
17. Hazardous Materials Storage Areas - hazardous fumes.
18. Armoury - cyanide gas.
19. Swimming Pool - chlorine gas.
20. Generators and Substations - smoke emissions.
21. Security Dog Section - incinerator.
22. Boilers and Steam generators - flue gases.
23. Air Conditioning Plants - CFCs and water vapour.

People to Interview:

1. OIC/SNCOIC Corrosion Control Facility.
2. OIC/SNCOIC Battery Maintenance Facility.
3. OIC/SNCOIC Motor Transport Section.
4. Squadron Senior Engineering Officers.
5. OIC/SNCOIC Safety Equipment Section.
6. Senior Facilities Officer.
7. Senior Medical Officer.
8. Environmental Health Officer.
9. SNCOIC Police Dog Section.
10. Base Photographic Officer.
11. Base Fire Officer.
12. OIC/SNCOIC Electroplating Section.
13. OIC Avionics Section.
14. Base Calibration Centre.
15. Australian Construction Services Depot Manager.

16. Warehousing Officer.

17. Base Armament Officer.

## II. Water Quality Management

### Legislative Basis:

1. Standards Association of Australia
   - AS 1546 - 1983: Small Septic Tanks.
   - AS 1547 - 1973: Code of Practice for Disposal of Effluent from Small Septic Tanks.
   - AS 2845 - 1987: Water Supply - Mechanical Backflow Prevention.
2. Australian Construction Service Policies:
   - Precautions Against Pollution of Stormwater Drains - E TD 125 1979.
   - Measures to Control Pollution of Aerodrome Stormwater Drains - TI 128 RA/HY 1979.
   - Flame Traps on Stormwater Drains - TI 129 RA/HY 1979.
   - Specifications for Wastewater Treatment Plants - TI 172 HY 1984.
   - Testing AFFF Fire Suppression Systems in Defence Aircraft Hangars - TI 181 FS 1987.
3. Australian Environment Council - Nutrients in Australian Waters 1987.
4. Guidelines for Drinking Water Quality in Australia - National Health and Medical Research Council.

5. Guidelines for Use of Reclaimed Water in Australia - National Health and Medical Research Council.
6. National Strategy on Wastewater and Effluent Management and Disposal - Australian Water Resources Council 1989.
7. New South Wales - Clean Waters Act 1970 and the Clean Waters Regulations 1972.
8. New South Wales - Water Board Act 1987.
9. Victoria - State Environment Protection Act 1970 and Amendments Act 1988.
10. Victoria - State Environment Protection Policy - Waters of Victoria 1988.
11. Victoria - Groundwater Act 1969.
12. Victoria - Melbourne and Metropolitan Board of Works Trade Waste By-Laws.
13. Queensland - Clean Waters Act 1971-1988 and the Clean Waters Regulations 1973.
14. Queensland - Sewerage and Water Supply Act 1949-1988 and the Sewerage and Water Supply Regulations 1987.
15. South Australia - Sewerage Act 1929-1975, Sewerage Act Amendment Acts 1984, 1987 and 1988, and the Regulations under the Sewerage Act.
16. South Australia - Water Resources Act 1976, and the Water Resources Act Amendment Acts 1976 and 1979.
17. South Australia - Groundwater (Border Agreement) Act 1985.
18. South Australia - Waterworks Act 1932-1977.

19. South Australia - Public and Environmental Health Act 1987.

20. Western Australia - Water Authority of Western Australia - Metropolitan Water Supply, Sewerage and Drainage By-Laws.

21. Western Australia - Health Act 1971-1973 - Bacteriolytic Treatment of Sewerage and Disposal of Effluent and Liquid Waste Regulations.

22. Western Australia - Environmental Protection Act 1986.

23. Western Australia - Health (Disposal of Liquid Waste) Regulations 1983.

24. Australian Capital Territory - ACT Electricity and Water - Draft Requirements for the Discharge of Wastes to the Sewer.

25. Australian Capital Territory - ACT Water Pollution Ordinance 1984 and Regulations 1984.

26. Northern Territory - Control of Waters Act 1980, the Control of Waters Amendment Acts of 1981 and 1985, and the Control of Waters Regulations 1982.

27. Northern Territory - Prevention of Pollution of Waters by Oil Act 1980.

28. Northern Territory - Water Supply and Sewerage Act 1988, the Water Supply and Sewerage Regulations 1988, and the Water Supply and Sewerage Regulations Amendments 1989.

Physical Features to Inspect:

1. Aircraft Wash Areas - fuels, oils and detergents.
2. Aircraft Parking and Refuelling Aprons -fuels and oils.
3. Aircraft Pavements - fuels, oils, and rubber tyre compounds.
4. Painting and Stripping Activities - paint solids, phenol and other solvent strippers, contaminated water, PUP and MEK.
5. Battery Maintenance Areas - non-neutral pH liquid wastes and heavy metals in liquid wastes.
6. Motor Transport Maintenance and Washdown Facilities - fuels, oils, detergents, solvents and silt.
7. Technical Maintenance Facilities - oils and greases.
8. Aircraft Hangars - fuels, oils, greases, solvents and AFFF.
9. Facilities Flight - chemical wastes, pesticides and fertilizers.
10. Photographic Facilities - silver-laden liquid wastes, other heavy metals, and non-neutral pH liquid wastes.
11. Kitchen Facilities - grease, detergents and oils.
12. Fire Training Activities - AFFF-laden runoff, unburnt fuel and chemical wastes from incomplete combustion.
13. Environmental Health Facilities - pesticides and herbicides.
14. Fuel Farms and Tanker Parking Areas - spills and leaks.

15. Grounds and Gardens Maintenance - pesticides, herbicides and putrescible matter.
16. Electroplating - heavy metal wastes.
17. Electronics Maintenance Facilities - heavy metal wastes and solvents from printed circuit board maintenance.
18. Base Calibration Centres - solvents.
19. Sewerage Treatment Systems - phenols, heavy metal laden sludge, BOD and raw sewage.
20. Interceptors and Traps - fuels and oils.
21. Waste Disposal Sites - wide range of potential leachates.
22. Hazardous Materials Storage Areas - fuels, oils and chemicals.
23. AAFCANS - fuels, oils, kitchen wastes and dry cleaning chemicals.
24. Armoury - cleaning chemicals and torpedo fuel.
25. Medical and Dental Facilities - x-ray and photographic materials, and pharmaceuticals.
26. Welfare Facilities - fuels, oils, glues, paints, thinners, solvents, and salty water.
27. Generators and Substations - waste oils fuel and PCBs.
28. RAAF Establishments - effect on quality and quantity of aquifers.

People to Interview:

1. Squadron Senior Engineering Officers.
2. Senior Facilities Officer.
3. OIC/SNCOIC Corrosion Control Facility.
4. OIC/SNCOIC Battery Maintenance Facility.
5. OIC/SNCOIC Motor Transport Section.
6. Base Photographic Officer.
7. Catering Officer.
8. Base Fire Officer.
9. Environmental Health Officer.
10. Warehousing Officer.
11. OIC/SNCOIC Electroplating Section.
12. OIC Avionics Section/Base Calibration Centre.
13. Australian Construction Services Depot Manager.
14. AAFCANS Manager.
15. Base Armament Officer.
16. Senior Medical Officer.
17. Senior Dental Officer.
18. OIC Welfare.

## III. Solid Waste Management

### Legislative Basis:

1. Draft Australian Guidelines for the Rehabilitation of Contaminated Land - National Health and Medical Research Council 1990.
2. New South Wales - Waste Disposal Act 1970, Waste Disposal (Amendment) Act 1984 and Waste Disposal (Further Amendment) Act 1989.
3. Victoria - State Environment Protection Act 1970 and Amendments Act 1988.
4. Victoria - Environment Protection (Prescribed Waste) Regulations.
5. Victoria - Environment Protection (Transport) Regulations.
6. Victoria - State Environment Protection Policy - the Siting and Management of Landfills Receiving Municipal Wastes (Draft).
7. Queensland - Refuse Management Regulations 1983.
8. South Australia - Waste Management Act 1987 and Regulations under the Waste Management Act 1987.
9. Western Australia - Environmental Protection Act 1986.

Physical Features to Inspect:

1. Engineering Maintenance Facilities - waste materials.
2. Facilities Flight - workshop wastes.
3. Incinerators - contaminated residues.
4. Kitchen Facilities - putrescible matter, grease and dry waste.
5. Construction and Demolition Activities - inert wastes.
6. Grounds and Gardens Maintenance - refuse.
7. Trade Waste Treatment Plants - backwash and sludge.
8. Interceptors and Traps - putrescible matter.
9. Waste Disposal Sites - almost anything.
10. AAFCANS - kitchen wastes and dry garbage.
11. Welfare Facilities - rubbish, putrescible matter and animal wastes.
12. Swimming Pool - filter backwash.
13. Base Recycling Centre - check for any inappropriate materials.

People to Interview:

1. Squadron Senior Engineering Officers.
2. Senior Facilities Officer.
3. Senior Medical Officer.
4. Environmental Health Officer.
5. SNCOIC Police Dog Section.

6. Catering Officer.

7. Australian Construction Services Depot Manager.

8. AAFCANS Manager.

9. OIC Welfare.

## IV. Hazardous Materials Management

### Legislative Basis:

1. Standards Association of Australia:
   - AS 1216 - 1984 Part 1: Classification and Class Labels for Dangerous Goods.
   - AS 1216 - 1984 Part 2: HAZCHEM Emergency Action Code.
   - AS 1216 - 1984 Part 3: NEPA Hazard Identification Code.
   - AS 1216 - 1984 Part 4: UN Substance Identification Numbers.
   - AS 1596 - 1989: LP Gas - Storage and Handling.
   - AS 1678: Emergency Procedure Guide - Transport.
   - AS 1940 - 1988: The Storage and Handling of Flammable and Combustible Liquids.
   - AS 2022 - 1983: Anhydrous Ammonia - Storage and Handling.
   - AS 2030: The Approval, Filling, Inspection, Testing and Maintenance of Cylinders for the Storage and Transport of Compressed Gases.
   - AS 2187: Explosives Storage, Transport and Use.
   - AS 2188 - 1988: Explosives - Relocatable Magazines for Storage.

- AS 2400 Part 21 - 1986: Packaging for Dangerous Goods.
- AS 2508: Safe Storage and Handling Cards for Hazardous Materials.
- AS 2714 - 1984: The Storage and Handling of Hazardous Chemical Materials - Class 5.2 Substances - Organic Peroxides.
- AS 1692 - 1983: Tanks for Flammable and Combustible Liquids.
- AS 1727 - 1975: Tank Containers.
- AS 2809 - 1985: Road Tank Vehicles for Dangerous Goods.
- AS 2430 - 1987: Classification of Hazardous Areas.
- AS 1719 - 1981: Recommended Common Names for Pesticides.
- AS 1870: Standard for Development - Pesticides for Agricultural Use.
- AS 2507 - 1984: The Storage and Handling of Pesticides.

2. Australian Code for the Transport of Dangerous Goods by Road and Rail - Advisory Committee on the Transport of Dangerous Goods 1987.
3. National Guidelines for the Management of Clinical and Related Wastes - National Health and Medical Research Council 1988.

4. New South Wales - Environmentally Hazardous Chemicals Act 1985, the Environmentally Hazardous Chemicals Regulation 1985 and the Environmentally Hazardous Chemicals (Amendment) Act 1987.
5. New South Wales - Dangerous Goods Act 1975 and the Dangerous Goods regulation 1978.
6. Victoria - Health (Radiation Safety) Regulations 1984.
7. South Australia - Dangerous Substances Act 1979, the Dangerous Substances Act Amendment Acts of 1980, 1985, 1987 and 1988, and the regulations under the Dangerous Substances Act.
8. Western Australia - Explosives and Dangerous Goods Act 1961.
9. Western Australia - Flammable Liquids Regulations 1967.
10. Western Australia - Health Act 1911 - Toxic and Hazardous Substances Regulations 1968.
11. Western Australia - Radiation Safety Act 1975 and the Radiation Safety (General) Regulations 1983.
12. Australian Capital Territory - ACT Dangerous Goods Ordinance 1984.
13. Australian Capital Territory - ACT Radiation Ordinance 1983.
14. Northern Territory - Dangerous Goods Act 1970, and the Dangerous Goods Regulations 1985.
15. Northern Territory - Radiation (Safety Control) Ordinance.

Physical Features to Inspect:

1. Painting and Stripping Activities - paints, phenol and other solvent strippers, PUP and MEK.
2. Battery Maintenance Areas - sulphuric acid and potassium hydroxide.
3. Technical Maintenance Facilities - petroleum products and solvents.
4. Safety Equipment (Life Support) Sections - glues.
5. Aircraft Hangars - petroleum products and solvents.
6. Facilities Flight - pesticides, paints and solvents.
7. Photographic Facilities - photographic chemicals.
8. Environmental Health Facilities - pesticides, herbicides, and radioactive calibration sources.
9. Construction and Demolition Activities - construction chemicals and asbestos.
10. Grounds and Gardens Maintenance - petroleum products, pesticides and herbicides.
11. Electroplating - heavy metals.
12. Electronics Maintenance Facilities - heavy metals and solvents for printed circuit board maintenance.
13. Trade Waste treatment Plants - dosing chemicals.
14. Base Calibration Centres - solvents and radioactive sources.
15. Hazardous Materials Storage Areas - chemicals and radioactive substances.

16. AAFCANS - dry cleaning chemicals.
17. Armoury - cleaning chemicals, torpedo fuel and cyanide gas.
18. Medical and Dental Facilities - dental amalgam, x-ray and photographic materials, and pharmaceuticals.
19. Welfare facilities - glues, paints, thinners petroleum products and solvents.
20. Swimming Pool - chlorine and dosing chemicals.
21. Facilities Flight - storage and application of pesticides and herbicides.
22. Grounds and Gardens Maintenance - pesticides and herbicides.
23. Environmental Health Facilities - pesticides, herbicides, contaminated containers and storage residues.
24. Technical Maintenance Facilities - storage of oils and greases.
25. Aircraft Hangars - storage of oils and greases.
26. Facilities Flight - storage of fuels and oils.
27. Motor Transport Maintenance Facilities - storage of fuels, oils and greases.
28. Fuel Farms and Tanker Parking Areas - spills and leaks.
29. Underground Storage Tanks - leaks.
30. Hazardous Materials Storage Areas - fuels and oils.
31. AAFCANS - underground fuel and oil tanks.
32. Transmitting Stations - underground fuel tanks.

33. Generators and Substations - underground fuel tanks.

People to Interview:

1. OIC/SNCOIC Corrosion Control Facility.
2. OIC/SNCOIC Battery Maintenance Facility.
3. Squadron Senior Engineering Officers.
4. OIC/SNCOIC Safety Equipment Section.
5. Senior Facilities Officer.
6. Base Photographic Officer.
7. Environmental Health Officer.
8. Australian Construction Services Depot Manager.
9. OIC/SNCOIC Electroplating Section.
10. OIC Avionics Section/Base Calibration Centre.
11. Warehousing Officer.
12. AAFCANS Manager.
13. Base Armament Officer.
14. Senior Medical Officer.
15. Senior Dental Officer.
16. OIC Welfare.
17. OIC/SNCOIC Motor Transport Section.
18. Base Radio Officer.

## V. Hazardous Waste Management

### Legislative Basis:

1. Standards Association of Australia:
   - AS 1216 - 1984 Part 1: Classification and Class Labels for Dangerous Goods.
   - AS 1216 - 1984 Part 2: HAZCHEM Emergency Action Code.
   - AS 1216 - 1984 Part 3: NEPA Hazard Identification Code.
   - AS 1216 - 1984 Part 4: UN Substance Identification Numbers.
   - AS 2187: Explosives Storage, Transport and Use.
   - AS 2507 - 1984: The Storage and Handling of Pesticides.
2. Australian Code for the Transport of Dangerous Goods by Road and Rail - Advisory Committee on the Transport of Dangerous Goods 1987.
3. National Guidelines for the Management of Clinical and Related Wastes - National Health and Medical Research Council 1988.
4. Code of Practice for the Disposal of Radioactive Wastes by the User - National Health and Medical Research Council 1985.

5. Australian Environment Council - National Guidelines for the Management of Hazardous Wastes 1986.
6. New South Wales - Environmentally Hazardous Chemicals Act 1985, the Environmentally Hazardous Chemicals Regulation 1985 and the Environmentally Hazardous Chemicals (Amendment) Act 1987.
7. New South Wales - Dangerous Goods Act 1975 and the Dangerous Goods regulation 1978.
8. Victoria - State Environment Protection Act 1970 and Amendments Act 1988.
9. Victoria - Environment Protection (Prescribed Waste) Regulations.
10. Victoria - Environment Protection (Transport) Regulations.
11. Victoria - Environment Protection (Scheduled Premises and Exemptions) (Amendment) Regulations.
12. Victoria - Health (Radiation Safety) Regulations 1984.
13. South Australia - Waste Management Act 1987 and Regulations under the Waste Management Act 1987.
14. South Australia - Dangerous Substances Act 1979, the Dangerous Substances Act Amendment Acts of 1980, 1985, 1987 and 1988, and the regulations under the Dangerous Substances Act.
15. South Australia - Planning Act 1982 and the Planning Act Amendment Act 1987.

16. South Australia - Radiation Protection and Control Act 1982, the Radiation Protection and Control Act Amendment Act 1986, and the Ionising Radiation Regulations 1985.
17. Western Australia - Health (Disposal of Liquid Waste) Regulations 1983.
18. Western Australia - Health (Disposal of Asbestos Waste) Regulations 1984.
19. Australian Capital Territory - ACT Administration Proposed Clinical Waste Ordinance.
20. Australian Capital Territory - Environment Protection Section Guidelines for the Disposal of Chemicals.
21. Australian Capital Territory - ACT Radiation Ordinance 1983.
22. Northern Territory - Dangerous Goods Act 1970, and the Dangerous Goods Regulations 1985.

Physical Features to Inspect:

1. Painting and Stripping Activities - paint solids, phenol and other solvent strippers, contaminated water, air scrubber wastes, PUP, MEK.
2. Battery Maintenance Areas - sulphuric acid, potassium hydroxide and contaminated casing wastes.
3. Technical Maintenance Facilities - solvents.

4. Aircraft Hangars - beryllium-contaminated wastes from cannons, waste petroleum products and solvents.
5. Facilities Flight - chemical wastes, pesticides and paint solids.
6. Incinerators - incomplete combustion of hazardous chemicals.
7. Photographic Facilities - silver-laden liquid wastes, other heavy metals, and non-neutral pH liquid wastes.
8. Environmental Health Facilities - pesticides, herbicides, contaminated containers and radioactive calibration material.
9. Construction and Demolition Activities - construction chemicals, asbestos and PCBs.
10. Grounds and Gardens Maintenance - pesticides and herbicides.
11. Electroplating - heavy metal wastes.
12. Electronics Maintenance Facilities - heavy metal wastes from printed circuit board maintenance.
13. Trade Waste Treatment Plants - phenols, heavy metals, dosing chemicals, backwash and contaminated sludge.
14. Base Calibration Centres - solvents and radioactive materials.
15. Sewerage Treatment Systems - phenols, heavy metal-laden sludge and raw sewage.
16. Hazardous Materials Storage Areas - intractable wastes, chemicals and radioactive substances.

17. AAFCANS - dry cleaning chemicals.
18. Armoury - explosive residues, cleaning chemicals, torpedo fuel, cyanide gas and other contaminated wastes.
19. Firing and Bombing Ranges - unexploded ordnance and explosive residues.
20. Medical and Dental Facilities - contaminated materials, dental amalgam, silver-laden wastes, pathological materials, pharmaceuticals and x-ray and photographic materials.
21. Welfare facilities - glues, paints, thinners and solvents.
22. Transmitting Stations - PCB contamination.
23. Generators and Substations - PCB contamination.
24. Lighting - PCBs in ballast.

<u>People to Interview:</u>

1. OIC/SNCOIC Corrosion Control Facility.
2. OIC/SNCOIC Battery Maintenance Facility.
3. Squadron Senior Engineering Officers.
4. Senior Facilities Officer.
5. Senior Medical Officer.
6. Environmental Health Officer.
7. Base Photographic Officer.
8. OIC/SNCOIC Electroplating Section.

9. OIC Avionics Section/Base Calibration Centre.

10. Australian Construction Services Depot Manager.

11. Warehousing Officer.

12. AAFCANS Manager.

13. Base Armament Officer.

14. Senior Dental Officer.

15. OIC Welfare.

16. Base Radio Officer.

## VI. Natural and Cultural Resources and Social Issues Management

### Legislative Basis:

1. The Environment Protection (Impact of Proposals) Act 1974.
2. The Australian Heritage Commission Act 1975.
3. The Australian National Parks and Wildlife Conservation Act 1975.
4. The Great Barrier Reef Marine Park Act 1975.
5. Northern Territory - Environmental Assessment Act 1982 and the Environmental Assessment Administrative Procedures.
6. Northern Territory - Soil Conservation and Land Utilization Act 1980 and the Soil Conservation and Land Utilization Amendment Act 1985.
7. Northern Territory - Conservation Commission Act 1980, the Conservation Commission Amendment Acts of 1985 and 1986.

### Physical Features to Inspect:

1. RAAF Establishments - financial, employment and social implications for the local community, restrictive land use, and noise and visual impacts.

2. Heritage Buildings - visual, and community issues.
3. Register of the National Estate.
4. RAAF Establishments - soil erosion and stormwater runoff.
5. Boilers and Steam Generators - energy issues.
6. Air Conditioning Plants - energy issues.
7. Lighting - energy issues.
8. Motor Transport Washdown Facilities - deployment residues including weeds, seeds and animal parts.
9. Construction and Demolition Activities - soil erosion.
10. Grounds and Gardens Maintenance - weed spread and soil erosion.

<u>People to Interview:</u>

1. Officer Commanding Base Support Wing.
2. Senior Facilities Officer.
3. Australian Construction Services Depot Manager.

## VII. Buffer Zone Management

### Legislative Basis:

1. Standards Association of Australia
   - AS 2187: Explosives Storage, Transport and Use.
   - AS 2021 - 1985: Acoustics - Aircraft Noise Intrusion - Building Siting and Construction.

### Physical Features to Inspect:

1. Aircraft Pavements - noise.
2. Engine Run-up Facilities - noise.
3. Flight Paths - noise, safety.
4. Firing and Bombing Ranges - explosive ordnance safety distances and noise.
5. Explosive Ordnance Storage, Preparation and Loading Facilities - explosive ordnance safety distances.
6. Airfield - defence airfield design criteria.
7. Transmitting Station - electromagnetic radiation.
8. Motor Transport Maintenance Facilities - noise.
9. Engineering Maintenance Facilities - noise.
10. Generators and Substations - electromagnetic radiation, and noise.
11. Security Dog Section - noise.
12. Boilers and Steam generators - noise.

People to Interview:

1. Administrative Staff Officer.
2. Squadron Senior Engineering Officers.
3. OIC Engine maintenance section.
4. Base Executive Officer.
5. Senior Air Traffic Control Officer.
6. Base Armament Officer.
7. Warehousing Officer.
8. Senior Facilities Officer.
9. Base Radio Officer.
10. OIC/SNCOIC Motor Transport.
11. Australian Construction Services Depot Manager.
12. SNCOIC Police Dog Section.

## VIII. Environmental Contingency Management

### Legislative Basis:

1. Standards Association of Australia
   - AS 1216 - 1984 Part 2: HAZCHEM Emergency Action Code.
   - AS 1216 - 1984 Part 3: NEPA Hazard Identification Code.
   - AS 1216 - 1984 Part 4: UN Substance Identification Numbers.
   - AS 1678: Emergency Procedure Guide - Transport.
   - AS 2187: Explosives Storage, Transport and Use.
   - AS 2508: Safe Storage and Handling Cards for Hazardous Materials.
2. Northern Territory - Dangerous Goods Act 1970, and the Dangerous Goods Regulations 1985.

### Physical Features to Inspect:

1. Environmental Health Facilities - spills and leaks of pesticides and herbicides.
2. Fuel Farms and Tanker Parking Areas - spills and leaks.
3. Hazardous Materials Storage Areas - intractable wastes, fuels, oils, chemicals and radioactive substances.

4. Corrosion Control Facilities - spills and leaks of stripping materials and waste waters.
5. Electroplating Workshops - spills and leaks of electroplating materials and waste waters.
6. Engine Maintenance Facilities - spills and leaks from solvent baths.

People to Interview:

1. Environmental Health Officer.
2. Warehousing Officer.
3. OIC/SNCOIC Corrosion Control Facility.
4. OIC/SNCOIC Electroplating Section.
5. OIC Engine Maintenance Section.
6. Base Fire Officer.
7. Senior Medical Officer.
8. OIC RAAF Police.
9. Senior Facilities Officer.
10. Australian Construction Services Depot Manager.
11. Squadron Senior Engineering Officers.
12. OIC/SNCOIC Battery Maintenance Facility.

ANNEX B TO
THE PROPOSED
RAAF EAMP

## AUDITOR'S CHECKLISTS

This annex provides an example of an auditor's checklist for each of the following eight environmental audit protocols:

I. Air emissions management,

II. Water quality management (including drinking water and waste water discharge),

III. Solid waste management,

IV. Hazardous materials management,

V. Hazardous waste management,

VI. Natural and cultural resources and social issues management,

VII. Buffer zone management (including noise, airfield design criteria, and explosive ordnance requirements), and

VIII. Environmental contingency management.

## I. Air Emissions Management

1. Air Emissions from Boilers and Steam Generators.

a. New South Wales - Clean Air Act 1961 and Clean Air Regulations 1964 and 1988:

(i) Determine whether emission testing has been performed on the flue gas.

(ii) If records are available at the facility, verify that:

- The measured mass of solid particles does not exceed 0.4 g/m$^3$ of residual gas adjusted to a basis of 12% $CO_2$.
- Air impurities are not darker than shade 1 on either the Ringelmann Chart or a miniature Smoke Chart.
- The blackening index of soot does not exceed shade 3 when determined by the Bacharach filter paper method.

(iii) If no records are available, arrange for emission testing to be conducted.

## II. Water Quality Management

1. Discharge of Drains into Receiving Waters.

a. New South Wales - Clean Waters Act 1970 and the Clean Waters Regulations 1972:

(i) Confirm that a license is held at the facility, and that any conditions or requirements are being met.

(ii) Confirm that the receiving waters have been classified as Class 'C' (Controlled waters) in terms of the Clean Water Act.

(iii) Check the records held at the facility to verify that:

- Biochemical oxygen demand does not exceed 20 mg/l (or less if specified by the license).
- Non-filtrable residue does not exceed 30 mg/l (or less if specified by the license).
- Wastes are being treated in an approved manner.
- Faecal coliform density does not exceed 200/100 ml.
- Discharge is free of grease, oil, solids, unnatural discolouration, and settleable matter.

## III. Solid Waste Management

1. Waste Disposal at Off-Base Landfills.

a. Victoria - State Environment Protection Policy - the Siting and Management of Landfills Receiving Municipal Wastes:

(i) Confirm that the landfill site is EPA licensed.

(ii) Check that only those types of wastes which may be deposited at landfill sites are being disposed of in this manner. Permitted wastes include domestic garbage, solid inert wastes, and putrescible wastes.

(iii) Check that no prohibited wastes are being sent for disposal at landfill sites. Prohibited wastes include soluble chemical wastes, hazardous wastes, and liquid wastes.

## IV. Hazardous Materials Management

1. Hazardous Materials Storage Areas.

a. Standard Association of Australia - AS 1216:

(i) Ensure that all dangerous goods are properly classified and labelled in accordance with the United Nations system.

(ii) Ensure that all dangerous goods are labelled with the appropriate HAZCHEM emergency action code to allow for proper emergency action to be taken in the event of fire or spillage.

(iii) Ensure that all dangerous goods are labelled with the appropriate NEPA hazard identification code which provides information in the areas of health, fire and reactivity.

(iv) Ensure that all dangerous goods are labelled with the appropriate UN substance identification number which enables exact identification of substances and instant correlation with associated emergency procedures.

## V. Hazardous Waste Management

1. Disposal of Radioactive Wastes.

a. Code of Practice for the Disposal of Radioactive Wastes by the User - National Health and Medical research Council:

(i) Ensure that proper packaging materials and procedures are being utilised for the preparation of radioactive wastes for transport and disposal, including a check of the following:

- Radioactive waste material for disposal is to be packaged in closed drums, opaque plastic bags or multi-layer paper bags on the premises of the user before transport.
- All three forms of packaging are acceptable for disposal at landfills.
- Opaque plastic bags or multi-layer plastic bags are suitable for disposal in incinerators.
- Packaging material should be chosen such that it remains the packaging in which the radioactive material is ultimately disposed of by whatever method is chosen.

## VI. Natural and Cultural Resources and Social Issues Management

1. Proposals for New Works.

a. The Environment Protection (Impact of Proposals) Act 1974:

(i) Ensure that the environmental consequences of all new works proposals have been adequately considered.

(ii) Ensure that an environmental clearance has been granted by the appropriate authorised delegate for proposals assessed as having no significant impact. Ensure that an Environmental Certificate of Compliance (ECOC) has been issued for such proposals.

(iii) Ensure that all proposals which are potentially significant have been referred to a higher authority for consideration.

(iv) Ensure that a Notice of Intention (NOI) has been prepared for any proposals which may affect the environment to a significant extent, or which involve a sensitive issue, and that the proposal has been forwarded to DASETT for consideration as to whether an Environmental Impact Statement (EIS) is required.

## VII. Buffer Zone Management

1. Aircraft Noise Management.

a. Standards Association of Australia AS 2021 - 1985: Acoustics - Aircraft Noise Intrusion - Building Siting and Construction:

(i) Check that the base has a current Australian Noise Exposure Forecast (ANEF) map for the airfield and for any air weapons ranges associated with the base.

(ii) Confirm that the flight paths on which the ANEF maps have been prepared are still current.

(iii) Check that the base has a noise contour map for high noise level ground sources such as engine run-up facilities.

(iv) Check that no incompatible development is taking place or proposed for high noise level areas on-base.

(v) Where high noise level ANEF and dB(A) contours extend beyond the base boundaries, check that buffer zone acquisition or control is being sought. Where this is not practical, check that adequate land use controls have been put in place by the appropriate local government authority.

## VIII. Environmental Contingency Management

1. Hazardous Materials Storage Areas.

a. Northern Territory - Dangerous Goods Act 1970, and the Dangerous Goods Regulations 1985:

(i) Ensure that the type and maximum quantity of dangerous goods permitted to be handled at any one time is not exceeded.

(ii) Ensure that adequate contingency plans are in place for accidental spills or other emergencies.

(iii) Check that all necessary protective equipment, fire-fighting equipment, and other emergency equipment is in place and is being properly maintained.

(iv) Ensure that adequate training is provided to all personnel with regard to contingency plans and emergency equipment.

(v) Check that proper warning signs, such as HAZCHEM emergency action codes, are properly displayed.

(vi) Ensure that adequate security measures are in place.

ANNEX C TO
THE PROPOSED
RAAF EAMP

## AUDIT APPRAISAL QUESTIONNAIRE

At the conclusion of each audit review, following the distribution of the final environmental compliance audit report, an audit appraisal questionnaire is to be completed by the base Environmental Management Committee. The purpose of this questionnaire is to assess whether the audit review has been considered relevant and of assistance to the base's efforts to maximise environmental compliance and quality. Copies of the completed audit appraisal questionnaire are to be forwarded to the audit team leader, the Command Facilities Officer, and to DGF-AF/WMEE.

## ENVIRONMENTAL AUDIT APPRAISAL QUESTIONNAIRE

The purpose of the environmental audit appraisal questionnaire is to provide the base Environmental Management Committee with an opportunity to comment on the effectiveness of the environmental audit review process. Environmental compliance audits are intended to assist the base to maximise environmental compliance by providing an independent evaluation of the status of environmental compliance at the base. Comments on the relevance and effectiveness of the audit review, along with constructive criticism, are therefore encouraged. Feed-back on the process provides both a quality check and a means to constantly improve the environmental audit review process. This in turn should assist the RAAF in achieving the highest possible level of environmental compliance performance.

Base:

EMC Chairman:

Period of the audit visit:

Please indicate the extent to which you agree or disagree with the following statements by circling the appropriate code, as follows:

| | |
|---|---|
| SA = Strongly Agree | D = Disagree |
| A = Agree | SD = Strongly Disagree |
| UD = Undecided | NA = Not Applicable |

1. The auditors were prepared and knowledgeable:

   SA A UD D SD NA

2. The audit was conducted in a professional manner:

   SA A UD D SD NA

3. The audit staff had sufficient knowledge and understanding of the operations, facilities and processes of this base:

   SA A UD D SD NA

4. The audit staff had sufficient technical skills and experience:

   SA A UD D SD NA

5. The audit staff exhibited a good awareness of current events relevant to this base:

   SA A UD D SD NA

6. The audit staff showed interest and enthusiasm:

   SA A UD D SD NA

7. The audit staff were adequately supervised:

   SA A UD D SD NA

8. The audit staff was overly concerned with unimportant or immaterial detail checking:

SA A UD D SD NA

9. The audit report was factual and accurate:

SA A UD D SD NA

10. The audit report contained adequate explanation for the findings and recommendations:

SA A UD D SD NA

11. There was adequate discussion of the audit report between the auditors and base management at the exit briefing:

SA A UD D SD NA

12. The audit report was unduly concerned with trivia:

SA A UD D SD NA

13. The audit report was useful to base management:

SA A UD D SD NA

14. The audit process was effective and of assistance to base management in their efforts to maximise environmental compliance performance:

SA A UD D SD NA

15. The EMC would recommend that environmental compliance audits continue to be conducted:

SA A UD D SD NA

Comments:

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# Vita

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The purpose of this research was to develop an Environmental Audit Management Plan (EAMP) tailored to meet the specific requirements of the Royal Australian Air Force (RAAF). The research also examined the resources which would be required to introduce the proposed EAMP into the RAAF. The literature on environmental compliance auditing identifies a number of essential characteristics required for an effective environmental auditing program. These characteristics, in conjunction with the USEPA design guidelines for the development of audit programs for government agencies, were used to guide the development of the RAAF EAMP. Information on Australian environmental legislation, DOD/RAAF policies and regulations, and details of the RAAF Base Tindal Environmental Management Plan were placed within this framework to produce the EAMP. The USAF Environmental Compliance Assessment and Management Program (ECAMP) was also used as a practical example of an existing audit management plan to provide further guidance in the preparation of the RAAF EAMP. To determine what would be required to implement the proposed EAMP, data on the implementation and operation of ECAMP was collected and analysed. From this, estimates of the resources required for the EAMP were prepared.

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